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REGULATIONS

BOARD OF WATER SUPPLY

NEW YORK

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ENGINEERING BUREAU
BOARD OF WATER SUPPLY
CITY OF NEW YORK

REGULATIONS

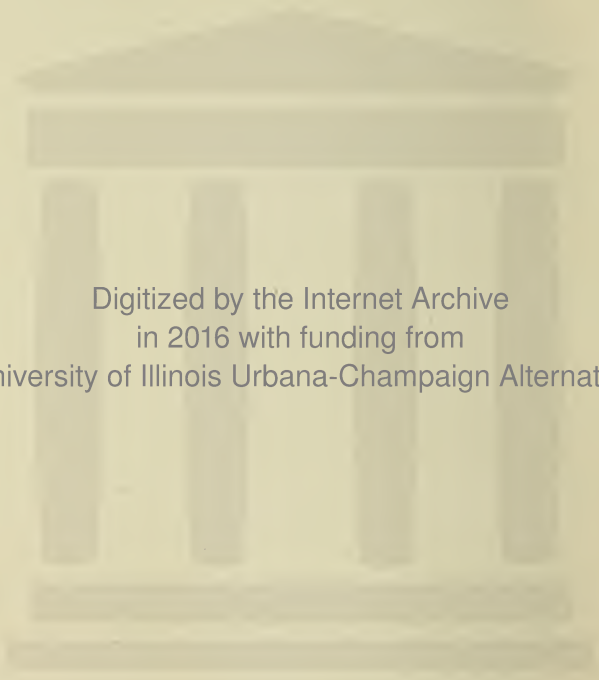
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Engineering



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LETTER OF CHIEF ENGINEER

299 Broadway, New York,
April 20, 1906.

Members of Engineering Bureau:—

These general regulations have been prepared to insure uniform and correct methods in all departments of the Engineering Bureau. They must be carefully studied and conscientiously observed. Obviously some details will have to be determined by each Department Engineer for the peculiar requirements of his work. Special rules, whenever they are necessary, must harmonize with these general instructions.

Systems will not run themselves. Success depends upon the faithfulness of men. Each member of the force is expected to co-operate loyally with the others in maintaining a high degree of efficiency in all the work of the Bureau.

Yours truly,
(Signed) J. WALDO SMITH,
Chief Engineer.

ORGANIZATION

1. The Board of Water Supply of the City of New York consists of three Commissioners appointed by the Mayor. Its forces are divided into an Administration Bureau and an Engineering Bureau.

2. The Administration Bureau is under the general supervision of the Secretary, and at the head of the Engineering Bureau is the Chief Engineer. There are three Consulting Engineers. These officers report directly to the Board.

ADMINISTRATION BUREAU

3. The Administration Bureau has charge of official records, accounts, payrolls, the purchase of equipment and supplies, and of general executive matters. The work is divided among an auditor, a head bookkeeper, a chief clerk and a paymaster, assisted by the necessary stenographers, clerks and messengers.

4. All legal affairs come to this Bureau, and so far as necessary, are referred to the Corporation Counsel or to special counsel.

5. Real estate transactions and the settlement of all claims relating to real and personal property acquired by the Board and all claims for damages will be handled by a special department of this Bureau.

ENGINEERING BUREAU

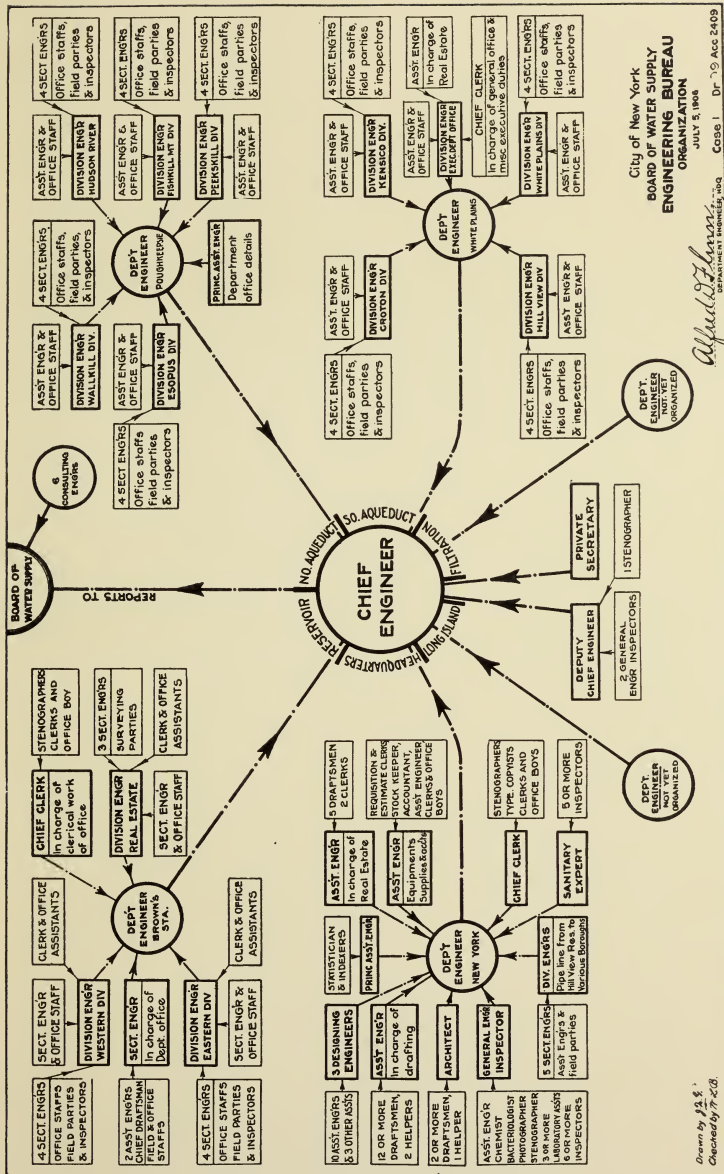
6. The Engineering Bureau is composed of six departments, determined by the character and location of different parts of the work, namely: Headquarters, Reservoir, Northern Aqueduct, Southern Aqueduct, Filtration and Long Island. The departments are divided into divisions, and the divisions are subdivided into sections.

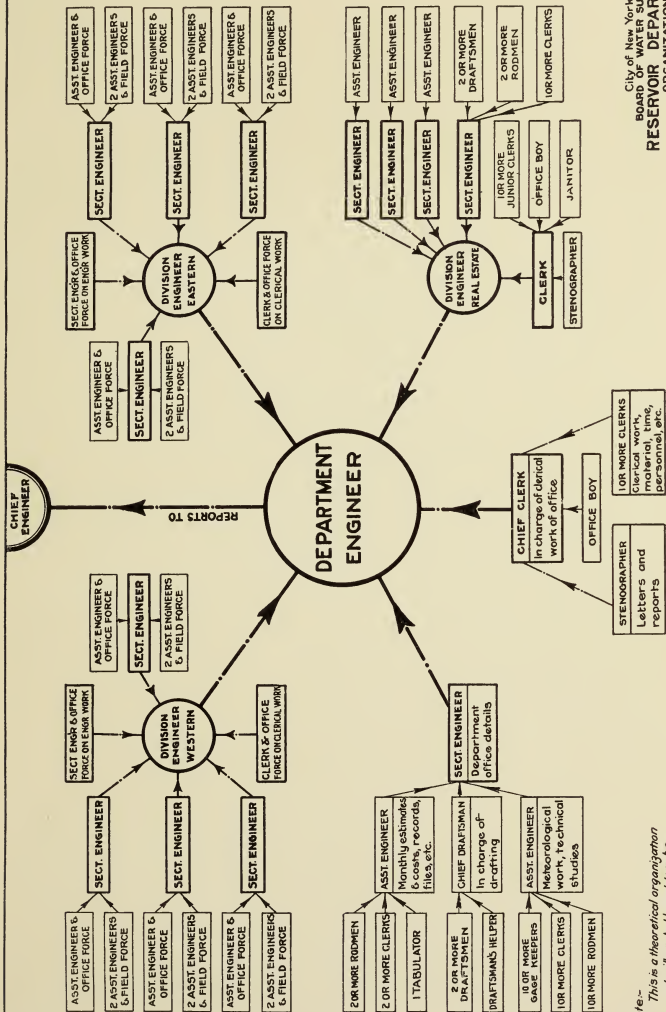
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7. This Bureau has charge of all engineering matters, including surveys of all kinds, designs and specifications, superintendence of construction, and inspection of materials.

8. Communications from the Engineering Bureau to the Administration Bureau will pass through the hands of the Chief Engineer, Deputy Chief Engineer, or the Department Engineer of the Headquarters Department.

9. The organization of the Engineering Bureau, so far as it can be predicted, is shown by the accompanying diagrams, which are approximate only and subject to modification as the work develops.





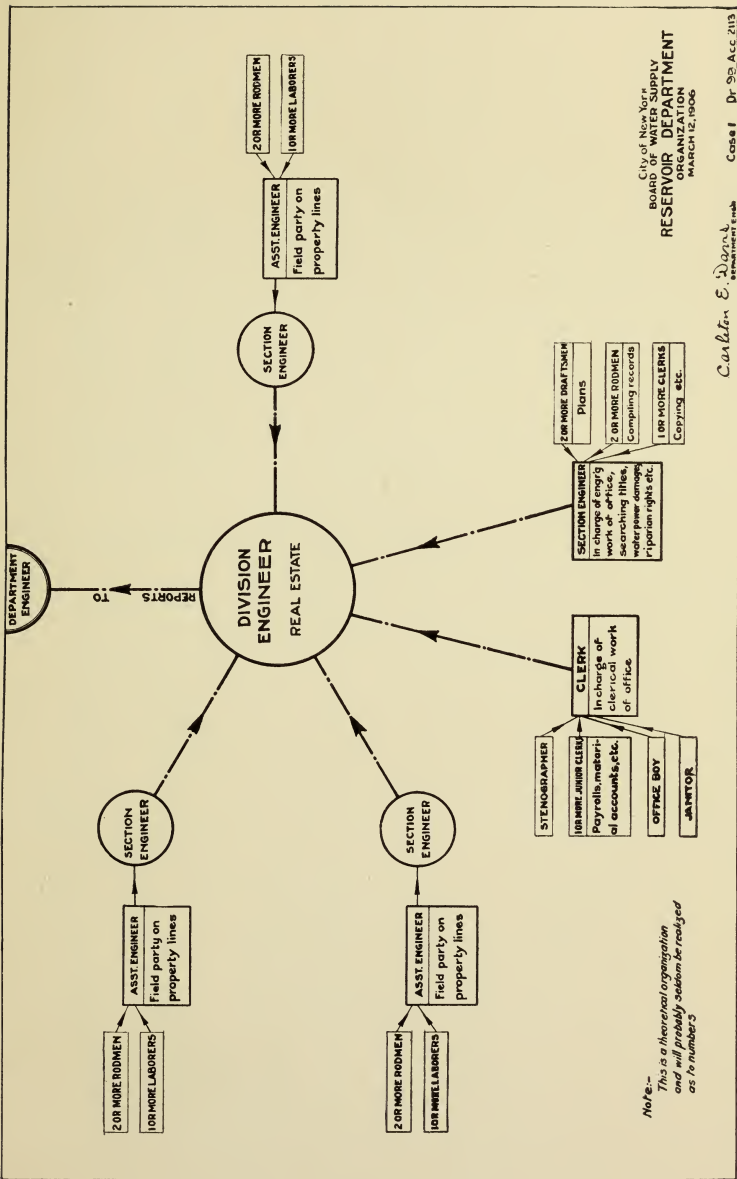
City of New York
BOARD OF WATER SUPPLY
RESERVOIR DEPARTMENT
ORGANIZATION
MARCH 12, 1906

Charles E. Davis
DEPARTMENT ENGINEER

Case 1 Dr 99 Acc 2111

Note:-
This is a theoretical organization
and will probably seldom be
realized as to numbers

Drawn by J. A. G.
Checked by J. A. G.



CIVIL SERVICE REGULATIONS

10. Civil Service regulations must be carefully followed in all matters relating to selection for appointment, promotion, discipline, transfers, resignation and dismissal of employees. Any action affecting the civil service standing of any employee must be promptly reported to Headquarters office, New York.

11. *All communications to the Civil Service Commission and all communications to employees or applicants relating to civil service matters appertaining to the Engineering Bureau must pass through the office of Headquarters Department.*

12. Temporary or provisional appointments to positions in the classified service can be made only from special eligible lists furnished by the Civil Service Commission after non-competitive examinations. The names of all men whom it is desired to have admitted to such examinations must be sent to Headquarters office. They will be received up to the date set by Headquarters Department and transmitted to the Civil Service Commission.

GENERAL INSTRUCTIONS

13. Hours of work in office and field shall be determined by each department engineer. Every employee must be punctual in attendance and faithful in performance of duty. Absence or tardiness without leave will be considered a misdemeanor.

14. If a man finds he will have to be absent, on account of illness, accident or other unforeseen difficulty, he must get someone, if he can not do so himself, to see that his superior officer is immediately informed of the reason, by the speediest means.

15. Whenever the work demands it, employees in the classified service may be required to work overtime, or at irregular hours, or on holidays. In return they will not be docked for unavoidable absence, and, as far as practicable, may be allowed time off to compensate for overtime.

16. Employees should not entertain friends or attend to private business during working hours. If there should be sufficient occasion for receiving a personal caller, he must be met in the waiting room or similar place where conversation will not interfere with the work of others.

17. Vacation at the rate of one working day per month in any calendar year, to be taken at times permitted by the department engineer, will be allowed each employee in the classified service in so far as this practice will not interfere with the proper conduct of the work. They will not be permitted to take vacations until after six months of service with the City, but not necessarily with this Board.

18. Every employee should treat the public with courtesy.

19. In each office one man or more shall be designated to open the office at a suitable hour in the morning. It should be somebody's duty to see that everything is left in proper

GENERAL INSTRUCTIONS

condition at night, especially to care for late mail and *return documents and drawings to vaults*, or other places of safe keeping.

20. The proper date must be put on each letter, memorandum, sketch, computation, page of field notes, drawing or other paper as soon as it is made or acquired.

21. Tables and notes or other papers of which tissue copies will not be required, shall be written in record ribbon, unless otherwise specified by the engineer.

22. All ribbons used must be Rapid Roller purple copying, or black record, excepting that red may be used for special purposes.

23. Papers on which computations or similar work is in progress must be kept in note covers, subjects being separated by partition leaves of thin cardboard or colored paper, with index tabs. When a subject or some division of a subject has been completed, or the papers have become bulky, the sheets should be transferred to an Ideal cover, or a No. 721 I-P cover, 2" thick, with suitable label and index.

24. Every employee should always sign his name in a uniform style on payrolls, letters and other official papers. First name, middle initial and last name is a good form of signature, but any other form than mere initials and last name is preferred. Initials and last name may be used if previously adopted as a man's legal signature.

25. Whenever there is a change of address for payroll or mail, Headquarters office must be notified immediately.

26. Proper receipts must be obtained for each map, drawing, paper, book, or other article lent, even if it is expected to be returned in a very short time. Blank forms have been prepared for this purpose. Nothing is to be allowed to go from any office without proper permission. Someone should be held responsible for securing receipts.

27. In all classes of work the requisite degree of accuracy should be attained with the least outlay of time and money.

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Unnecessary refinement is costly; carelessness will be cause for discipline.

28. Persons seeking information about any part of the work should be referred to the man in responsible charge. Employees are cautioned not to make public official knowledge gained in the discharge of their duties.

29. Objections will be made at times to the employees entering upon or crossing private property for purposes of survey. This objection can be overcome generally by a courteous explanation of the work with a guarantee of no wanton damage.

30. Official stationery is to be used only for official business. Employees must not use such stationery when writing for trade catalogs, reports or other things for private use.

31. Telephones in the offices are for department business. Private calls may be made only under such conditions as the department engineer shall prescribe. All long-distance private calls shall be paid for by the person making them.

32. No smoking will be allowed in office buildings, except by special permission of the department engineer.

STANDARD SIZES AND FORMS

33. Standard sizes for stationery, drawings, etc., have been established for universal use. Departure from standards may be made only by permission from the Headquarters office, and for sufficient reason. Papers not of a standard size should, if possible, be cut or folded to a standard size for filing; if too small, they may be mounted on standard sheets.

34. SIZE	DESCRIPTION
3" x 5"	Index cards, memoranda, reference lists on cards.
5" x 8"	Field notes, record cards, printed specifications and many printed forms, and pamphlets for field pocket use.
5" x 15", 22" and 29"	allowing for punching for rings in note cover, and
8" x 10", 15", 20", 25"	approximately, <i>to be folded to 5" x 8"</i> , for diagrams, tables and drawings to be used in field note covers or otherwise with 5" x 8" papers.
6" x 9"	Printed reports and other books or pamphlets.
8½" x 11"	Letters, computations, official photograph mounts, and many printed forms.
8½" x 14"	Traverse sheets, estimates for contract payments, expense accounts, leases and legal forms.
11" x 8½", 13" and 18"	Sketches, diagrams, tables and small drawings to accompany computations, letters or reports.
14" x 17"	Payrolls.
26" x 40", 20" x 29", 14½" x 20"	Drawings of all kinds. It is intended that by far the greater number of contract and working drawings shall be 20" x 29".

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Real estate and topographical maps will be mostly
26" x 40".

19" x 24"—Green cross-section sheets to be used for estimates
and other purposes.

35. Standard printed forms for routine work have been
provided. Other such forms will be added by the Head-
quarters Department as necessity arises. A complete sample
file of printed forms should be kept in each department office
for reference.

LETTER WRITING

36. Write concisely. Deal with one subject only in each letter. Do not write unnecessary letters.

37. Letters or other communications should be written to record important transactions within the Engineering Bureau or between members of this Bureau and outside persons.

38. Routine notes of acknowledgement, letters of which it is not necessary to file copies and other relatively unimportant communications, in the discretion of the writer, need not be copied.

39. All communications intended for the personal attention of the Chief Engineer should be addressed to him by name. Letters concerning Civil Service affairs, men, equipment, supplies, or other matters of routine in charge of Headquarters Department should be addressed to the Department Engineer of Headquarters Department.

40. All official communications from one department to another should be addressed to the department engineer. Excepting routine communications, no official letters should be sent by a subordinate without the knowledge of the proper superior.

41. Each letter should be signed by or in the name of the person having responsible charge of the matter to which the letter relates. In many instances it will be advantageous to have the letter dictated by the assistant having the matter immediately in hand. The initials or name of the person dictating the letter should be placed in the upper left corner, with the initials of the stenographer. If a letter is signed for a responsible officer, the initials or name of the person writing the signature must appear beneath the name of the responsible officer.

42. Kinds of letters to be signed by or in the names of

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subordinates of various ranks will be determined as necessary, from time to time, by the Chief Engineer and department engineers. Such subordinates shall be very careful to show to their superiors all letters of which the superiors should have knowledge, preferably before they are sent, in order that the superiors may keep properly informed of the work for which they are responsible.

43. Letters written to persons outside the Board of Water Supply forces requesting information should be signed by a department or division engineer or person of equal rank, and at least in all important cases, a department engineer or other proper officer should be informed of such letters so as to avoid annoying and unnecessary repetitions of such requests to the same outside person.

44. Letters to contractors or their agents, excepting those concerning routine details, should be signed by, or in the name of the department or division engineer having charge of the work. Such letters should deal only with matters within the province of the writer, and care should be exercised to refer to the Chief Engineer or Deputy Chief Engineer all matters demanding his official attention. In writing routine letters to contractors or their representatives, section engineers, and others to whom such matters may be delegated, must be very careful not to exceed the authority given them.

45. A list of subjects for letters and other communications has been prepared; each one, written in any office of the Engineering Bureau, must have at its head a subject taken from this list, and following the subject, in parenthesis, should be written the exact subdivision of the subject to which the letter relates. If there is no suitable subject in the list a new one may be suggested for approval to Headquarters office, which will promptly notify department offices of additions to the list. For purposes of filing and indexing, subjects are designated by numbers and letters.

LETTER WRITING

INSTRUCTIONS TO STENOGRAPHERS

46. Stenographers and typewriters must be absolutely accurate in spelling, in the initials of names, and in addresses. They should punctuate and paragraph correctly, and call attention to errors of diction or rhetoric.

47. Leave a margin an inch wide at the left side of all papers. This will permit binding or placing in note covers if desired. Use paper of standard size, $8\frac{1}{2}" \times 11"$.

48. The initials of the person dictating a letter, if he be other than the one whose name is subscribed, and the initials of the stenographer should be put in the upper left corner of the first page of each letter. Each page after the first should have in its upper left corner the initials of addressee, and the page number in the upper right corner. When there are enclosures, Encl. should be put in the lower left corner of the last page, with a number to indicate the number of enclosures. If an enclosure is typewritten, in the lower left corner of its first page should be put Encl. in letter from to, giving initials of writer and addressee.

49. Stenographers must see that the right subject is placed at the head of each letter. If no subject is given by the one dictating, the stenographer or copyist must look up the right subject. If the subject as dictated is not worded as in the list of subjects, the stenographer or copyist must correct it. For these purposes copies of the list of subjects will be made accessible to all stenographers and typewriters as well as to persons dictating letters.

50. The name of a person or place, or other explanatory words, may be written after a general subject to indicate to what person or place the letter refers and aid in cross-referencing. Such words should always be put in parenthesis.

51. The original of each letter, excepting such as are not to be copied, must be written in copying ink.

52. For the reference files, carbon copies are to be made of all letters, reports, etc., which it is necessary to file in the

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office where they originate. All letters going out of any department office are to be copied on green paper. All correspondence within one department, weekly reports, formal communications from the Chief Engineer, and similar documents are to be copied on white paper.

53. In writing letters, both sides of the copy paper are to be used. After the first sheet of the letter has been written, using one side of the copy paper, this should be turned so that the second sheet of the letter can be copied on the other side. Subsequent sheets are to be copied in like manner. This will not apply to reports nor communications to the Board.

54. In addition to the above reference copy, tissue copies of all communications worthy of record are to be made, preferably on a roller copier, such as made by the Library Bureau or by Yawman & Erbe. Tissues of each day should be cut the following morning to standard size, fastened together and preserved in chronological order in suitable filing cases, plainly labeled. Tissues are not intended for ordinary reference but as a safeguard.

55. Some letters are written in the New York office of the Engineering Bureau which require the signature of a Commissioner or of the Secretary. Of such a letter a green copy should be made for the files of the Engineering Bureau besides the white copy for the Board's files. After the letter has been signed a tissue copy should be taken.

56. A typewritten or longhand copy of any document must be *carefully* compared with the original to insure *accuracy*, especially in *figures and names*.

REPORTS

57. The weekly reports of division and department engineers should be strictly progress reports and should state in an orderly way the work accomplished during the week covered by the report, using tabular forms or diagrams whenever these can be employed to advantage. In many such cases it is desirable to show the total work accomplished to date as well as that done during the week. So far as practicable, each man's reports should follow the same order from week to week, so as to expedite the compilation of information from such reports for the Chief Engineer's weekly reports and other purposes. Recommendations, requests and predictions should be put into letters and special reports should be written on investigations, accidents and similar subjects, although brief references to such special reports may be made in a weekly report.

58. Each section engineer shall make weekly reports to his division engineer for the week ending at noon on Saturday. Division engineers shall make weekly reports, ending Saturday at noon, in duplicate to the department engineer. The department engineer shall send one copy, accompanied by such brief statement as he considers necessary, together with a report of the department office, to the Chief Engineer. The other copy of the division report is to be filed in the department engineer's office. Reports must be mailed from department offices sufficiently early on Monday to reach the Chief Engineer on Tuesday morning. If a division engineer does not receive the written report of a section engineer or other subordinate at the proper time, he should get the substance of it by telephone in order to incorporate it in his own report. Regular reports *must be rendered punctually*.

59. During preliminary periods, before the organization for

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construction is completed, the method but not the time of collecting information for periodical reports may be modified as found necessary.

60. In Headquarters office the designing engineers, the principal assistant engineers, the architect and such others as may be designated shall prepare, at the end of each week, brief memoranda on 3" x 5" cards of the work in their charge. These memoranda need not mention purely routine work, unless important changes be made, but should report new work undertaken, work finished, and progress on work in hand.

61. All tables and appendices which accompany reports must have a note on them: Accompanying report of
.....(date) from.....to.....

62. All reports should be concise and clear and conveniently arranged; statistical matter should be put into tables or diagrams.

63. In writing special reports, state clearly the pith of the problem and the results of the investigation in one or two *brief* paragraphs at the beginning, then proceed with the detailed discussion in an orderly and logical progression. Conclude with a clear recommendation for action or a forcible statement of the lesson of the investigation.

COMMUNICATIONS TO THE BOARD

64. All communications to be acted on by the Board at its regular meeting on Wednesday morning should be ready on Tuesday afternoon. In case of emergency a limited number of important communications may be presented Wednesday morning.

65. An original and four carbon copies on white paper shall be made of all communications from the Engineering Bureau to the Board, the original and three copies for the board and one copy for the files of the Engineering Bureau.

66. Communications from field offices concerning matters to be presented to the Board should reach Headquarters if possible Monday.

HANDLING MAIL

67. All official mail must be received, stamped and distributed by the file clerk, in Headquarters office and other offices of sufficient size to need such services.

68. Each letter after being opened must be stamped by the file clerk as follows, or with such other dating stamp as may be provided:

ENG'R. BUREAU
' FILE No.....

REF'D	Sm	FL		
AT'D TO	S	F		

JUL 23 1906 1 08 PM

READY TO FILE a. S. F.

69. If a stamp of the kind shown is used, the number of the folder in which the letter is to be filed must be written after FILE NO. and in the first square after REF'D must be written the first two letters of the last name of the person to whom the letter is to be referred, as in the first case above in which the letter is to go to Mr. Smith. When this person is through with it, he must put the initial of his last name in the square after AT'D TO, under the abbreviation of his name. In the second square after REF'D the first person may write the first two letters of the last name of any person to whom he wishes to refer the matter, as in the second example in which Mr. Smith has referred it to Mr. Flinn. The second person, after handling the letter, must put his last initial in the square after AT'D TO, under the abbreviation of his name. He can refer it to a third person and so on until the matter has been completely attended to.

70. When placing his initial in the space after AT'D TO

HANDLING MAIL

and referring a letter to another person, one should be careful to indicate by pencil note on the margin what he has attended to or what remains to be attended to by the person to whom the letter is referred.

71. If a person wishes a letter returned to him after having referred it to another, he should refrain from putting his initial in the square after AT'D TO. The letter must then be returned to him before it is filed.

72. When the last person who is to attend to the matter in the letter shall have finished with it, he shall sign or stamp all his initials after READY TO FILE. The letter should then be placed in a basket for filing.

73. Communications addressed to the Chief Engineer by name, after being opened by the mail clerk and stamped with a time stamp, should be taken at once to the private secretary.

74. No letters originated in the Engineering Bureau, or received by it, should go to the Commissioners until they have been examined by the Chief Engineer or by a properly authorized officer of the Engineering Bureau.

FILING AND INDEXING IN GENERAL

75. Filing is the systematic putting away of papers, drawings, photographs or books. It should be done so that anything filed can be gotten easily and quickly by any one reasonably familiar with the method. The method should be so simple that it can be readily learned. So far as practicable, files should be arranged so naturally and logically and so well labelled as to necessitate a minimum use of an index.

76. An index should point the way to things in the files. An index should be as simple and obvious as possible in arrangement, with plenty of helpful guide or partition cards. Colors can be used advantageously to distinguish different kinds of cards in one index. Drawers or trays containing the cards should be plainly labelled.

77. Cross-reference cards should be made for a sufficient number of words under which a person may look for any subject to insure his finding the desired paper, drawing, photograph or book. But it is frequently better to let a person try two or three times than to write an excessive number of cross-reference cards for synonymous words. Do not increase the bulk of the index by useless cards.

78. All important uncertainties concerning filing and indexing should be referred to Headquarters Department.

79. Everything to be filed or to be returned to the files must be put in receptacles provided for the purpose. *Only designated file keepers* are to be allowed to put anything into or return anything to any file. Otherwise things are sure to be misplaced.

80. Anything taken from a file, bookcase or plan case must be accounted for at the time and must be returned as promptly as possible.

81. Only authorized persons shall have access, directly or indirectly, to the official files of letters, reports and other documents.

FILING AND INDEXING LETTERS, REPORTS AND OTHER COMMUNICATIONS

82. Letters, reports, etc., are filed in letter size, four-drawer, golden oak, unit vertical files of the type adopted by Headquarters Department. File units can be placed side by side to provide any number of drawers needed as the papers accumulate. In the drawers are folders of stout manila paper, each large enough to hold about fifty papers.

83. The index is on 3" x 5" cards, both white and colored cards being used to make convenient distinctions to expedite search. The cards are kept in single trays or in cabinets of two or more drawers, according to the size of the index. These also are of golden oak, on the unit plan.

84. An OUT card, 8½" x 11", is put in a folder whenever a letter is taken out, upon which is stated when the letter was taken out and to whom it was given.

85. Guides or partition cards having metal tips containing labels or alphabetical or other tabs are used to subdivide the contents of a letter file drawer, to expedite the finding of a desired paper.

GENERAL FILES

86. Filing is done by the numerical, vertical system, under which a list of suitable subjects is established, each subject being designated by a number and its subdivisions by letters and numbers. The folders are marked with these numbers and letters, and arranged numerically. Papers relating to any one subject or subdivision are placed, on edge, in the appropriate folder, in chronological order, so that when the folder is open flat with papers facing upward, the latest one will be on top. Upon each paper, when filed, should be written its file number to prevent it from ever being returned to any other than its own folder.

87. For purposes of filing and indexing, subjects are designated by numbers. Some subjects have no numbers, but below each on the index card is written: See, in-

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dicating that correspondence on that subject is filed in the folder to which reference is made.

88. Each paper will be indexed under the subject of the folder in which it is to be filed. Whenever a paper treats of, or relates indirectly to, more than one subject, cross-reference cards under appropriate headings should refer to it. In case of doubt the paper should be filed under the most probable subject, and cross-reference cards made under other possible headings.

89. Cross-indexing, that is making entries on two or more cards, will frequently be advantageous instead of, or in addition to, cross-referencing.

90. The following are samples of cards:

Borings,	12
Smith, John Brown, Wm. - - - - -	31

Stadia Rods,	46
Smith, John	

91. The first card indexes correspondence with John Smith filed in folder No. 12, which contains correspondence relating to borings. As some or all of Smith's correspondence

FILING AND INDEXING LETTERS, ETC.

Transits,	31
Brown, Wm.	

also refers to stadia rods, it is cross-indexed on the card for this subject.

92. The third card indexes correspondence with William Brown, filed in folder No. 31, which contains correspondence relating to transits, but some or all of Brown's correspondence also refers to borings and is therefore cross-indexed on the card for this subject.

CONTRACT CORRESPONDENCE

93. Correspondence concerning each of the formal numbered contracts shall be filed by itself according to the system described for the general file, using the same list of subjects so far as may be necessary. In these files each folder besides having the regular subject number shall have stamped conspicuously, CONTRACT NO. Files of two or more contracts may be put into the same drawer and separated by suitable guides, each guide being plainly labelled with the number of its contract and the name of the contractor.

94. Card indexes for contract correspondence likewise should be kept separate, but reference cards to information which may be for general application should be put into the index to the general file.

SPECIAL FILES

95. Most of the correspondence will be filed in a general file with a general index. In Headquarters office a few

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special files have been established and others may be added if found really necessary. A few similar special files may become advantageous in the field offices, but special files should be avoided, and with very few exceptions personal or individual files should not be allowed. Such files are likely to lead to confusion and so spoil a good system, besides causing unnecessary duplication of work and waste of stationery. Of course a man may withhold and properly care for communications of a semi-private or confidential nature which for obvious reasons should not be put in a general file.

96. The special files in Headquarters office are as follows:

1. Applications for employment.
2. Opinions of Corporation Counsel.
3. Communications of Chief Engineer to Board and of Board to Chief Engineer.
4. Weekly and other routine reports.

97. Applications for employment are filed alphabetically according to the names of the applicants. For purposes of reference applications are classified according to positions. These classes are indexed alphabetically, the name of each class being written on a guide card.

98. Opinions of Corporation Counsel are filed in chronological order and indexed with salmon colored cards in the general index under the subjects of which they treat.

99. Communications of the Chief Engineer to the Board are numbered in chronological order and have a special index. They are cross-indexed with blue cards in the general index under the subjects of which they treat. Communications of the Board to the Chief Engineer are filed and indexed in a similar manner.

100. Periodical routine reports are filed chronologically, each in its own series. Special indexes may be made for them, if found necessary.

101. Special reports are filed in the general file under the subjects of which they treat.

FILING AND INDEXING DRAWINGS

102. One man in each office shall be held responsible for the proper filing of the drawings and he alone should be allowed to put away drawings.

103. In each office *all* drawings received from other offices should pass first through the hands of a designated man, possessed of sufficient knowledge, who will see that each drawing is properly introduced into the system of filing and indexing or otherwise attended to.

104. Drawings are to be filed in the plan cases provided for the purpose and indexed on 3" x 5" cards which will be kept in convenient cabinets. Cases and drawers will be numbered. It is expected that suitable buildings will be erected by the Board for the field offices and that each office will be provided with a vault. Plan cases and other filing cases for these offices have been designed on the unit system to fit these vaults, but they are also suitable for use outside the vaults. All important drawings, indexes and other records should be kept in the vaults when not in actual use.

105. Besides bearing a case and drawer number to show where it is filed, each drawing will be given an accession number which will distinguish it from all other drawings and consequently be the convenient and certain designation for the drawing in computations, correspondence or conversation. Accession sheets will contain complete description and record of every drawing made or acquired by an office of the Bureau for permanent filing. There is a double space across the accession sheet for each drawing.

106. An accession number shall be given to a drawing as soon as it is well started—at any rate as soon as any computations are made relating to it. The exact title and description can be filled out on the accession sheet when they are determined. This applies to the paper drawing. The tracing of a drawing is given the number already taken, unless

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the drawing contains important matters not traced, or is traced on more than one tracing, or the original paper drawing is kept permanently, in which case a new number is taken for the tracing. The paper drawing should be endorsed: See tracing of same number, or: Traced partly as Acc., as the case may be.

107. If a drawing is revised, the new drawing should be given a new accession number and date and marked: Revised from Acc., and its predecessor should be marked: Superseded by Acc. The same notes should be written in the accession sheet under REMARKS, and on the index cards.

108. Temporary accession sheets, properly numbered on the line for each drawing, will be kept in each drafting office, on which the draftsmen can make entries as needed. When a temporary sheet is filled, a new sheet properly numbered in advance will be substituted. The filled sheet should promptly be checked and corrected, and then sent to Headquarters or some other office having a large flat-platen typewriter, where it will be neatly copied in triplicate. One copy, with the original, will be returned, the second sent to the appropriate department office and the third retained at Headquarters. These copies will be kept in suitable loose-leaf covers. After filing the final accession sheets and copies, the temporary sheets may be destroyed.

109. As soon as a drawing which is to be kept *permanently* in any Board of Water Supply office is received from some other Board office, it is to be indexed under its original accession number and not reaccessioned. Each drawing therefore will bear but one accession number by which it can always be identified in whichever office it may be.

110. The accession number is to be put in ink on each drawing in its lower right corner. The entry is to be made on the accession sheet, as directed below.

111. Under TITLE, write the title of the drawing in full, excepting the two lines which appear on all drawings made

FILING AND INDEXING DRAWINGS

in Board offices: City of New York. Board of Water Supply.

112. Under DESCRIPTION, write, briefly, enough about the drawing to tell what it shows. Do not repeat what is in the title but supplement it. Abbreviations which can be readily interpreted may be used here.

113. In the column headed PURPOSE OF DRAWING, use the following abbreviations:

- L Land plan, or map.
- P Preliminary drawing, or study.
- C Contract drawing.
- W Working drawing.
- E Estimate cross-section, progress diagram or similar drawing.
- R Record drawing (of completed construction work).
- Z Foreign drawing used for reference.

114. Under KIND OF PAPER AND SIZE IN INCHES, use the following abbreviations on the upper line and on the lower line write the outside dimensions of the drawing:

- | | |
|----------|---|
| W | White paper. |
| B | Brown paper. |
| T | Tracing cloth. |
| T P | Tracing paper. |
| W P | White print. |
| G P | Gray or green print. |
| B P | Blue print. |
| Black | Black print. |
| Lith | Lithograph. |
| Cr-Sec | Cross-section paper or cloth. |
| T Cr-Sec | Tracing cross-section paper or cloth. |
| Pro | Profile paper. |
| T Pro | Tracing profile paper. |
| Neg | Vandyke negative. |
| M | Mounted on cloth (to be written after other designation). |

REGULATIONS

115. The column headed WHERE FILE, should be filled *in pencil* with case and drawer numbers as soon as the drawing can be given a place in one of the plan cases. If the drawing should ever be put into another plan case, the numbers on the accession sheet should be changed at once, also the corresponding numbers on the drawing, and on all index cards.

116. In the column headed INDEX UNDER, shall be written a word, to be put on the index card, under which a person would naturally or properly look when searching for the drawing.

117. The different departments will be designated by letters, as follows, in filing, indexing and accessioning drawings, and will have the colors given for distinguishing index cards. Foreign drawings, meaning those originating outside of this Board's jurisdiction, will be designated by an X.

		Color of Cards
Headquarters Department	(no letter)	Salmon
Reservoir Department	R	Green
Northern Aqueduct Department	N	Blue
Southern Aqueduct Department	S	Fawn
Filtration Department	F	Cherry
Long Island Department	L	Canary
Foreign Drawings	X	Color of Dept. where filed.

118. Divisions will use their department colors and be designated as follows:

Headquarters Department	
Designing Division	(no letter)
Real Estate Division	E
Inspection Division	A
Pipe Line Division	P

FILING AND INDEXING DRAWINGS

Reservoir Department

Eastern Division	RE
Western Division	RW
Real Estate Division	RR

Northern Aqueduct Department

Esopus Division	NE
Wallkill Division	NW
Hudson River Division	NH
Fishkill Mountain Division	NF
Peekskill Division	NP

Southern Aqueduct Department

Croton Division	SC
Kensico Division	SK
White Plains Division	SW
Hill View Division	SH

119. Each department office and each division will accession all its drawings independently, each having a series of numbers beginning at 1; but each department office will place before the number its department letter. Each division will place its division letters before its number.

120. Thus: **491, S 5440** and **F 721** indicate drawings originated in the Headquarters, Southern Aqueduct and Filtration Department offices respectively, and **NE 299** is the accession number of a drawing originated in one of the offices of the Esopus Division of the Northern Aqueduct Department. Division offices will supply section offices with accession numbers by sending temporary accession sheets properly numbered in advance. Section office drawings will be accessioned as though they originated at division offices; that is, a section office will not have an independent series of numbers, but will use blocks of numbers in the division series.

121. The sections on the aqueducts shall be numbered with one series of numbers on each aqueduct, following the flow of the water, beginning on the Catskill Aqueduct, at the

REGULATIONS

Ashokan Reservoir and ending at the Hill View Reservoir. Other sections may be numbered with a separate series for each division. Drawings shall be filed in drawers in the cases primarily according to size, but groups of drawers of each size shall be assigned to drawings according to subjects, for the general drawings, and to sections for the aqueducts. In this way natural and usual groups of drawings will be found all together, without necessitating tedious references to the index cards for each drawing and the taking out and returning of the drawings themselves to many scattered drawers.

122. All drawings having a title referring to location along any aqueduct must have it so worded that the clause follows the flow of the water. For example: Location of Catskill Aqueduct from Fishkill to Peekskill, and not: from Peekskill to Fishkill. File such drawings in the drawer allotted to the section which includes the up-stream end, disregarding the down-stream end.

123. All drawings in each department and division office shall be indexed on SUBJECT cards of the form shown below, the distinguishing color of the department where the drawing originated being used. All of these cards are to be kept in the same index. The guide cards are buff colored.

SUBJECT	
TITLE	
DATE	
PURPOSE	
SCALE	ACC
KIND	CASE
SIZE	DRAWER

FORM NO 91 E

FILING AND INDEXING DRAWINGS

124. Cross-references shall be made in sufficient number to insure the finding of the drawing, plain white cards being used. Index cards shall be typewritten so far as practicable.

125. Drawings or copies of drawings from other Board offices, if filed in the office where received, shall be indexed on RECEIVED cards of the color of the department from which they come, these cards being kept as a separate index. In the Headquarters accession sheet of the department from which they come, note under Remarks as follows: Hqs. Copy Case.....Dr.....

ACC	RECEIVED
CASE	
DRAWER	
TITLE	
DESCRIPTION	
DATE	
PURPOSE	
SCALE	
KIND	
SIZE	
FORM NO 93E	

126. Should any drawing be sent to another office for permanent or temporary filing, or taken from its files for any other purpose, for any considerable length of time, a proper note should be made on the back of its index card. Receipt should be taken for any drawing leaving its file.

127. Division engineers may, if they see fit, devise methods of indexing their section office drawings so as to distinguish them from those originating in division offices.

128. If any drawing which has been given an accession number be destroyed or sent *permanently* from the office in which it was filed, a note of the facts shall be made in REMARKS column opposite the correct number on the final accession sheet.

FILING AND INDEXING PHOTOGRAPHS

129. Photographs are to be of uniform sizes, $6\frac{1}{2}$ " x $8\frac{1}{2}$ " for outdoor work and 7" x 10" for copying drawings. For special work suitable sizes may be permitted.

130. Finished photographs for the official file at Headquarters office are to be printed on $8\frac{1}{2}$ " x 11" heavy, unmounted Velox, platinum or other paper, giving a permanent black or gray picture on white ground. Photographs for department files may be like those for Headquarters, or mounted silver prints.

131. Each department is to number its photographic negatives in a series of its own, beginning with No. 1, and to keep an index of photographs, with a cross-index by numbers and the necessary cross-references. Each plate is to be marked in or near lower right corner with subject, location, date and number, the department letter being placed before the number with a space between. Plates are to be stored in places which will be designated by Headquarters office or by the department engineer.

132. Department engineers may furnish division and section offices with prints as they are needed, these prints to be indexed as already provided for department offices. Blue prints will probably be sufficient for these purposes.

133. Prints of official photographs must not be furnished gratis for private use. If feasible, arrangements will be made by which individuals may, with the permission of the department or division engineer, secure prints of specified photographs at cost.

134. Official files of photographs in Headquarters and field department offices are to be kept in standard $8\frac{1}{2}$ " x 11" letter file drawers. Files are to be divided, so as to keep photographs of real estate, construction progress photo-

FILING AND INDEXING PHOTOGRAPHS

graphs, and photographs for accident and damage cases separate. Each class should be subdivided by metal-tip guide cards, according to locality or subject. In each subdivision the pictures should be arranged in chronological order. An OUT card should be used if a photograph is taken from the file.

FILING AND INDEXING CATALOGS AND BOOKS

135. Reference books and manuals are indexed under titles and authors, and cross-indexed under subjects as fully as possible with a reasonable amount of work. The cards are then placed in the drawers or trays in alphabetical order. White cards are used for subjects and buff cards for authors.

136. Catalogs and circulars are classified under three sizes for convenience, as follows:

File A—Small catalogs, up to 7" x 9".

B—Medium, from A size up to 9" x 11½".

C—Larger sizes than B.

Each class is filed alphabetically by firm names. They are indexed by subjects and by firm names on 3" x 5" cards.

LISTING REFERENCES TO, AND REVIEWING ARTICLES IN, ENGINEERING PERIODICALS AND BOOKS

137. Whenever searching literature for existing knowledge to aid in designing or constructing portions of the works, information from periodicals, books and other sources is to be recorded under prearranged schedules of topics, made up carefully in detail, before looking up references, in order that a clear idea of the kind of information needed may be in mind. Below is given, as Example I, a schedule of topics used in looking up tunnels.

138. With the schedule of topics in mind, make a list of headings under which information is likely to be found in indexes; other headings will probably suggest themselves as the indexes are consulted and these should be added to the list. When subjects have been thus added, each index referred to should be run over again so that at the end of the work it can be said that each of the subjects has been looked up in each of the indexes. The list used in the case of tunnels is given below as Example II.

139. Lists of references should be kept with the same neatness as computations and will be filed with the information collected in order to show just what ground has been covered. The standard computation paper is to be used.

140. In reviewing, record information under as many of the topics in the schedule as are covered by the article. Minimize words by using the numbers of the topics, assuming that the notes will be read in connection with these topics. Record separately, either wholly or for such topics as are necessary, different sections of the work described in the article, when the work in one section is notably different from that in another and the requisite information for the separate record is given.

REGULATIONS

PERIODICALS

141. Consult such indexes of periodicals as directed by the engineer in charge, listing under each periodical the references which appear pertinent, and using a brief catch-phrase with each reference to indicate the nature of the information to be expected. For general engineering, the Engineering Index, Volumes I. to IV. (the fourth not yet being published but available at the office of the Engineering Magazine), the Indexes to Engineering News covering 1890 to 1904 and the volume of indexes of the Engineering Record will be found sufficient in most cases.

REPORTS, TREATISES, ETC.

142. It frequently will be necessary to consult public reports, treatises and other sources of information. The card catalog of the American Society of Civil Engineers, or such other libraries as may be available, will be found useful for this purpose.

143. The work up to this point should be done, or carefully followed, by a man who has a proper grasp of the subject to be investigated. The subsequent reviewing or searching may then be done by some painstaking assistant.

EXAMPLE I.

Schedule of Topics for Tunnel Research

144. Note: This list refers exclusively to through tunnels built from within, and not to tubes built or sunk, or subways built by open-cut method.

- o. Author of article and his connection with the work.
1. Name and purpose.
2. Location, both geographical and with reference to topography.
3. Name of designing engineer.
4. Name of constructing engineer.

LISTING REFERENCES

5. Name of contractor.
6. Size of finished tunnel (brief wording—details later).

Shafts

7. Depths of shafts.
8. Number of shafts—considerations controlling location.
9. Sizes of shafts—considerations controlling size.
10. Materials penetrated.
11. Methods of excavation, hoisting, etc.
12. Timbering; arrangement, sizes.
13. Lining; material, dimensions, conditions necessitating, pressures assumed or developed.
14. Progress and cost.

Tunnel Proper

15. Sketch with dimensions and details of cross-sections. If timbering details are available, sketch those also.
16. Design—loads assumed, timbering and lining; reasons for choice of section; comments on success or failure of different features; difficulties of construction; loads actually developed, hydrostatic or otherwise. Note especially about internal pressure in conduits for water works and similar service.
17. Length.
18. Material penetrated; comparison of preliminary investigation with actual finding; depth and character of overlying material.
19. Method of doing the work, heading or drift; loosening, loading and hauling material; shield, air pressure; freezing, etc.
20. Length of haul on surface and method of disposal of spoil.
21. (Hard ground.) Number, depth and size of hauls; heading and bench.
22. (Hard ground.) Speed of drilling, or data from which it can be computed.
23. (Hard ground.) Explosives, kind, charge, lbs. per cu.

REGULATIONS

yard or data from which it can be computed; heading and bench.

24. Accuracy of excavation, excess in size of hole obtained over that specified, reasons.
25. Lining: why used, material and methods of construction; care of water during construction.
26. Lining: classifications Lining and Backing—definitions, how measured and proportion of each as built.
27. Lining: space over arch, how filled.
28. Leakage: record specially all facts on leakage through ground and through lining, both during construction and after completion; also tests, inspection, etc.
29. Co-efficients: hydraulic, assumed in design; developed in tests.

Contractor's Plant

30. Brief description and cost: (a) hoisting, (b) drilling, (c) lighting, (d) ventilating, (e) pumping, (f) removing spoil. Facts about power and general operations, such as on handling water.
31. Provisions for care of men: hospitals; arrangement of air-locks, etc.; dangers, difficulties and remedies.
32. Chronology and progress: dates and intervals of time, showing progress broadly, and as far as given in detail, i. e. (a) date of signing contract, (b) work begun, (c) shafts finished, (d) excavation completed, (e) lining begun, (f) lining completed, (g) rates of progress.
33. Cost: any data given in as much detail as is found. On works of Metropolitan Water or Sewerage, do not record contract prices, as we have copies of bids; in other cases consult bids in supplements of magazines or elsewhere, and copy important items and totals.
34. Legal questions: Description of any litigation or discussions relative to measuring, or equity of specifications, classification of materials or quality of work.

LISTING REFERENCES

EXAMPLE II.

Tunnel Research

145. Topics Looked up in Indexes.

(Initial List.)

1. Aqueducts.
2. Drainage, drain.
3. Hydro-electric plants.
4. Irrigation.
5. Mining; mine drainage works.
6. Railroads, or railways.
7. Sewers, sewerage.
8. Shafts.
9. Tunnels, tunnelling, tunnel lining.
10. Water power development.

(Topics added as work progressed.)

Intakes.

Mining: congelation, freezing process.

Subway.

Underground railway.

Swelling earth.

Shield.

Viaducts: subaqueous.

Waterworks:—water supply.

COMPUTATIONS

146. For survey computations, such as stadia notes and traverse tables, and for estimates for payments under contracts, special sheets are provided, for which see sample books of printed forms.

147. Each assistant engaged upon general computations will be furnished with an *individual* computation cover holding standard punched computation sheets, $8\frac{1}{2}$ " x 11" in size, with printed blank heading. All general computations must be made in *ink* on these sheets, using one side only, except as otherwise directed by a department or division engineer. The margin on the left of each sheet must be kept blank. This will make it possible to get a print of any sheet, if needed, and thus save copying. Computers are expected to provide themselves with fountain pens for black and for red ink. Corrections shall always be in red, no erasures being made. Carter's Raven Black ink is suitable for obtaining blue prints.

148. A carefully selected and classified list of subjects for file numbers of computations has been prepared. This classification of subjects, with an explanation of its use, will be issued as a separate publication and assistants should study it so that computations may be made exactly in accordance with it. In this system numbers and letters are used to designate subjects and the nature of computations upon them. The list thus becomes an index showing the order of filing of computations, differing from the usual index in that it exists before the matter to be indexed is composed and constitutes a mould in which the matter is cast. The index therefore exists early in the work, instead of being delayed in formation until it is of little use.

149. In order that the index shall remain a true one, however, it is necessary that it shall be rigidly followed even

SUBJECT Catskill Aqueduct FILE NO. 3C.33 D
Size-Slope Computations for ACC NO. A 52
Quadruplicate Line of Steel Pipe SHEET TOT IN COMP.
 COMPUTER John Doe CHECKED BY Chas. Smith DATE Apr. 18 1906

MADE IN CONNECTION WITH Studies of Economic Slopes for
Catskill Aqueduct See 3C

To get a curve for variations in sizes
 & costs of pipe to carry 575 Mgd at
 different slopes
 By directions from Chief Engineer
 assume $C = 96$ for pipes after being
 in use.

Assume diam. $7\frac{1}{2}$, $8\frac{1}{2}$, $9\frac{1}{2}$, and $10\frac{1}{2}$
 and compute slopes
 4 pipes each taking $\frac{575}{4} = 144$ Mgd

Q	Dia.	Area	V	C	S
Mgd Lf/s	Ft.	Sq. Ft.	F.P.S.		$S = \frac{V^2}{48 \times D}$ Ft. per mi.
144 223	75	4442	5.04	96	0.00147 7.76
" "	85	567	3.93	"	0.000807 4.26
" "	95	709	3.14	"	0.000449 2.37

Formula for S above derived as follows

$$V = C \sqrt{rS} \quad r = \frac{\pi r^2}{2\pi r} = \frac{r}{2} = \frac{D}{4}$$

$$S = \frac{V^2}{C^2 r} = \frac{V^2}{(96)^2 \frac{D}{4}} = \frac{V^2}{(48)^2 D} = \frac{V^2}{2304 D}$$

REGULATIONS

when seemingly strained. To keep the work uniform a competent engineer should be designated, in each office, to supervise the selection of file numbers and do the filing.

150. Before beginning any computation, the File No., given in the index of subjects, should be ascertained and inserted in the sheet, after which, under Subject, should be written the classified subject and subdivision and, briefly and clearly, the nature of the computations. If the list of subjects seems inadequate or inapplicable in any case, the attention of the engineer in charge should be called to the matter so that a suggestion for improving the list may be sent to Headquarters and necessary additions or modifications made.

151. When as is usual a number of computations of various sorts are necessary to solve a comprehensive problem, the individual computations should be general in their application and elementary so far as possible, so that the individual computations may be useful in solving other problems. For such cases, the results only need be collected and used in solving the specific problem. In order, however, to show under what conditions the individual computations have been made, a reference to the main problem that occasioned them is to be placed, by subject, stated briefly and by file and accession numbers, after the heading, Made in Connection with.

152. In the space for Acc. No. on each computation sheet is to be placed the department and division letters, given in paragraphs 117 and 118, followed by a hyphen, the letter denoting the computer, and the figures giving the serial number of the computation sheets used by the computer in question.

153. In each office, in addition to the engineer in charge of filing of computations, a man is to be designated to keep a stock of numbered sheets for each man belonging to the office. This rule has been found necessary to insure against duplication of numbers and uncertainty as to the next con-

COMPUTATIONS

secutive number. Temporary men or men doing little computing need not be given letters but may use sheets belonging to the men under whom they are working.

154. The signature of the person making the computation and of the one checking, as well as the date on which the computations are made, should be inserted in the places provided on each sheet. In writing the date, the month should be indicated by the first three letters of its name and not by a figure. In case it requires more than one sheet to complete a computation on a given subject, the sheets are to be numbered consecutively, 1, 2, 3, etc., in the space, Sheet No., and the whole number of sheets in the computation is to be inserted; but if one sheet only is used these spaces should be filled with a dash.

155. Sufficient explanatory notes should be inserted to make each computation perfectly clear and whenever data are taken from another sheet its file and accession numbers should be given in brackets. The letters indicating department and division should be omitted unless the reference is to a sheet of another department or division. Whenever referring to a drawing, use its accession number. A summary of the principal results of a computation should be made when it is evident that such a summary would be convenient for reference.

156. Under no condition shall a sheet be destroyed. If for any reason a sheet should become useless the prefix X, meaning superseded, is to be inserted before the file number and the sheet turned in with the other sheets at the proper time. SUPERSEDED, should also be written or stamped in red across the face. Superseded sheets are to be filed in a separate book.

157. During the day while computations are being made or checked assistants may, for convenience, remove the sheets from their individual computation books, but at night all sheets must be returned to the covers and fastened in. Avoid,

REGULATIONS

so far as possible, having sheets with computations lying around loose.

158. Suitable binders or covers, I. P. No. 721 or Ideal, are provided for the permanent filing of computation sheets, in which completed sheets will be arranged according to the system. Each binder should be plainly marked so as to show the file numbers included in it. These will be distinguished as *reference* computation books.

159. Whenever sheets have been completed and checked, they must be turned in promptly to the engineer in charge of filing computations, who will file them in *reference* computation books. Sheets which have been thus filed *should seldom be removed* and then only under such regulations for refiling correctly as the engineer in charge of filing may find suitable. Sheets fastened in covers must be turned with care so as to avoid damage.

160. If it should be found that an error has been made in any computation, the engineer in charge must be notified at once, so that the mistake may be rectified in all places affected.

161. Be accurate, systematic and neat. Do not waste time on unnecessary refinement. Do not use more decimals than the accuracy of the data and the necessities of the result make advisable.

162. Use slide rules, computing machines, logarithms and diagrams whenever their use will economize time and secure sufficient accuracy. Men are expected to provide themselves with small slide rules, but more expensive computing devices will be furnished whenever adequate economy will result.

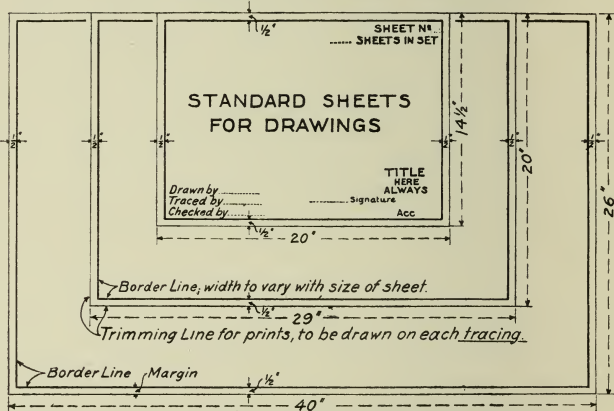
163. Checking, especially of important computations, must be done *independently*. Going over the other man's figures is not checking. Errors in data, methods, deductions or judgment must be detected, as well as blunders in mathematics.

COMPUTATIONS

164. Make it a rule to use tabular form for computations whenever possible. A little preliminary thought will usually show a method of tabulation and the computation will be more quickly done, more likely correct and much more easy of reference, besides enabling additions to be made to widen the scope of the results. Mathematical work which can be done by slide rule or computing machine should be left off the sheets. The tabulation will indicate the process followed. Be brief. Use judiciously abbreviations which are sufficiently self-evident. Do not repeat unnecessarily. Do not waste time stating matters of common knowledge such as value of π and what it means, or deductions of formulas which can be readily found in text books.

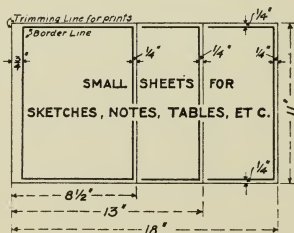
STANDARD SIZES FOR DRAWINGS

Note: Drawings of all kinds should be made of Standard sizes, using several sheets if necessary for large maps and similar drawings. Irregular sizes will be permitted only for weighty reasons. Keep drawings flat.



Tracings are to be cut $\frac{1}{4}"$ outside the trimming lines for prints. Paper drawings which are to be filed should be cut to same dimensions as prints

These sheets can be cut economically from stock sizes of drawing paper, tracing cloth, blueprint paper, etc



City of New York
BOARD OF WATER SUPPLY
STANDARD SIZES FOR DRAWINGS
AND ARRANGEMENT OF SHEETS
SEPT 1, 1905

Case Dr 89 Acc. 2001

DRAWINGS

165. The word drawing as herein used, includes drawings in ink or pencil on any kind of paper, tracings, sun prints and lithographs.

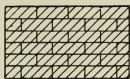
166. Standard sizes of drawings, shown by an accompanying diagram, have been determined with regard to convenience and economy of materials. Drawings must be made of the standard sizes, and for filing should be kept flat. Additional instructions, relating to border lines and other details, will be found on the diagram.

167. Long rolls and excessively large drawings must be avoided; they are inconvenient to use and file. Generally it will be found that several standard sheets will serve the purpose better; if necessary, a key or index sheet can be made for such a set of sectional drawings. For some parts of the real estate work and in a few other cases large drawings may be advantageous.

168. Field draftsmen may make their maps from survey notes on bond or similar paper such that sun prints, to be sent to Headquarters, can be made from the originals. This bond paper may be used judiciously for other kinds of drawings also, to avoid tracing.

169. Almost all finished drawings should be so made that they can be reduced by photographing or lithographing to one-fourth their length or width, or even less in case of very large drawings, and still be legible. This will require care, particularly to have the lettering of sufficient size and properly spaced, and the lines of proper weight and color.

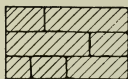
170. Standard section lining, topographical signs and other conventional symbols have been established, as shown by accompanying plates. Some additions may become necessary, but the standards must be used whenever possible.



BRICK



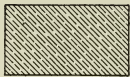
CUT STONE



COURSED ASHLAR



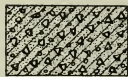
UNCOURSED ASHLAR



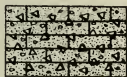
RUBBLE



CONCRETE



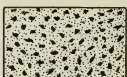
REINFORCED CONCRETE



CONCRETE BLOCK



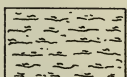
CYCLOPEAN MASONRY



GRAVEL



SAND



EARTH



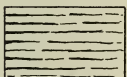
EARTH (Surface)



HARD ROCK



SOFT ROCK



PUDDLE



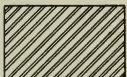
WATER
(BLUE OR BLACK)



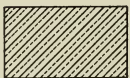
CAST IRON



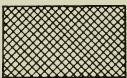
WROUGHT IRON



STEEL



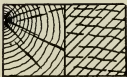
COMPOSITION



LEAD



RUBBER



WOOD

City of New York
BOARD OF WATER SUPPLY
STANDARD CROSS SECTIONS
JULY 27, 1906

Drawn by J. J. S.

Case 1 Dr 93 Acc 2389

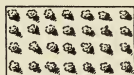
NOTE :- Blue used on tracings will be made opaque either by backing in india ink or other method that will insure printing



GRASS



CLEARING



ORCHARD



WOODED LAND



FOREST



EVERGREEN TREES



VINEYARD



CULTIVATED LAND



NURSERY



GREEN HOUSE



CEMETERY



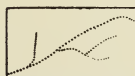
MARSH

BLUE



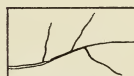
PONDS or LAKES

BLUE



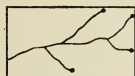
INTERMITTENT STREAM

BLUE



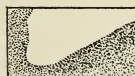
STREAM

BLUE

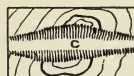


SPRING

BLUE



SAND



EXCAVATION

BURNT SIENNA



EMBANKMENT

BURNT SIENNA

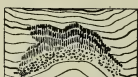
City of New York
BOARD OF WATER SUPPLY
TOPOGRAPHICAL SIGNS
FEBRUARY 7, 1906

Drawn by JMS

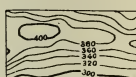
Case Dr 99 Acc 2095



CLIFF
BURNT SIENNA



QUARRY
BURNT SIENNA



CONTOURS
BURNT SIENNA



FRAME BLD'G



STONE BLD'G



BRICK BLD'G

PROPERTY LINE

TOWNSHIP LINE

COUNTY LINE

CITY, VILLAGE &
BOROUGH LINE

PRIMARY ROAD

SECONDARY ROAD

PICKET FENCE

WIRE FENCE

POST & RAIL

WORM or SNAKE FENCE

HEDGE

STONE FENCE

ELECTRIC ROAD

ELECTRIC CONDUITS

SINGLE TRACK
DOUBLE
STEAM RAILROAD
400' = 1"

SINGLE TRACK
DOUBLE
STEAM RAILROAD
100' = 1"

RAILROAD BRIDGE

HIGHWAY BRIDGE

TRESTLE

WATER & GAS PIPES
BLUE

SEWERS & UNDERGROUND DRAINS
BURNT SIENNA

NOTE :- Symbols to be used on topographical maps drawn to scales of 100' to 400' = 1".
For maps of larger scale than 100' = 1" symbols may be changed at discretion of draftsman.

TRIANGULATION STA. Δ

STADIA STATION \square

MILE STONE \square

BENCH MARK \square

BOUNDARY STONE \square

City of New York
BOARD OF WATER SUPPLY
TOPOGRAPHICAL SIGNS
FEBRUARY 7, 1906

Cdse 1 Dr S9 Acc 2095

DRAWINGS

Sizes of symbols may be varied somewhat according to the scales of the drawings. If other and unusual signs are needed, they must be carefully explained by a suitable legend on the drawing.

171. On maps, show direction of stream by arrow, if necessary. An arrow indicating true north should be on each map or other drawing of land, unless co-ordinates are shown; so far as practicable, north should be at the top of the sheet.

172. All contours should be drawn in Higgins' burnt sienna ink, or brick red, if burnt sienna is not available, or in corresponding water colors. Contours at distinguishing intervals, such as hundred foot, may be black, at discretion of the engineer in charge.

173. Contour intervals shall be 1, 2, 5, 10, 20 or 100 feet, according to the scale and purpose of the map. Numbers relating to contours should be the same color as the lines.

174. Lines of tracings, including contours, should be made sufficiently heavy and opaque to give clear lines on prints. If necessary, bottled ink is to be thickened by rubbing stick ink in it.

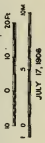
175. Before beginning to trace a sheet, plan its arrangement so as to have the various sections, elevations or plans logically and neatly arranged, with suitable spaces for subtitles, notes and scales.

176. Each map and land plan should, so far as practicable, show co-ordinate lines referred to some fixed point, the latitude and longitude of which is known. The co-ordination shall be on a rectangular system, parallel with and perpendicular to, the meridian through this point.

177. Since most drawings of structures, and many others, are to be traced, only a *minimum* amount of work should be done on the pencil drawings. Such pencil drawings, excepting unimportant ones, should not be destroyed as soon as traced, but should be kept in suitable drawers, approximately in order of dates, until all reasonable probability of their

SHEET No.
SHEETS IN SET

City of New York
BOARD OF WATER SUPPLY
EAST DURHAM RESERVOIR
CROSS-SECTION OF MASONRY DAM



*NOTE :- This sheet shows the standard arrangement
for drawings, if it is size 20x29"
The title and border etc. should be the same
for 26x40"
For smaller sizes use similar type and border
line, but on a smaller scale.*

Drawn by
Checked by
Contract No.

Case Dr. Ass.
Supt. Eng.

DRAWINGS

being referred to has passed. They need not be filed and indexed, unless containing something not traced to which computations refer. For many simple things the small amount of necessary pencilling can be done directly on the tracing cloth.

178. Those in charge of drafting forces should constantly seek to get desired results in the most economical ways.

179. Checking of drawings must be done independently and carefully. Following in the tracks of the man who first did the work is not checking. The man who checks a drawing will be held responsible for its accuracy. Each drawing should be verified by a competent person with a degree of care commensurate with its importance.

180. All drawings not actually in use should be put away each day at the close of work, and those actually in use should be carefully covered at night. In field offices *all* valuable drawings must be put into the vaults at night.

EXAMPLES OF LETTERING

SECTION A-A

(TO BE USED FOR CONTRACT DRAWINGS)

ELEVATION

(TO BE USED FOR WORKING DRAWINGS)

NOTES:-

Be careful to have liberal and uniform spaces between words

The space reserved for title should be about $3\frac{1}{2} \times 6$ " to 5×8 " according to size of sheet and other conditions

In lower right hand corner put Accession No. thus: Acc NE 299

(TO BE USED FOR ALL DRAWINGS)

REGULATIONS

181. The size and style of lettering should be governed by the size of the sheet and the nature of the drawing. Lettering should be done with care so as not to obscure the drawing. Plain lettering is to be used excepting on a comparatively few special maps and other drawings. Plain single-stroke letters shall be used, for notes, for most titles except those of contract drawings and official maps, and for other lettering, excepting on maps requiring distinctions between different kinds of names. For contract drawings and some others, heavier titles will be required, as indicated. Samples of lettering are shown herewith.

182. The sizes of letters shown in the table on page 76 have been adopted for standard titles. They are the same for both vertical and sloping letters. The angle of slope is 3 horizontal to 8 vertical or about 70° .

183. The sizes are given in hundredths of an inch for draftsmen and in points for printing on the press at Headquarters office. In order to obtain uniformity between the drafted and printed titles, draftsmen must follow not only the style shown in the illustrations, but the proportions of letters, weight of stroke, spacing and slope. The nicety of lettering required in drafted titles depends upon the kind of drawing. If the third line of the title is a very short one, the next larger size type shown in the table may be used.

184. In general, lettering is to be done by one man, designated for this work, in each office. Each draftsman, however, will be expected to dimension his drawings properly. The spelling of names should receive careful attention.

185. For survey maps and some other drawings rubber stamps may be used for titles and other lettering, leaving only a little to be done by hand. Sets of drawings having many titles nearly alike may with economy be sent to Headquarters to be printed on the Bureau press.

186. Accurate simple graphical scales shall be put on all drawings, together with metric scales on all contract draw-

CROSS SECTION OF MASONRY DAM

1 0 5M

Carlton E. Davis - Dept Eng

Case 2 Dr51 Acc R1628

PT'S	IN.
10	{.10 .06
12	.12
18	.18
12	.12
10	{.10 .06
10	.10
10	.10
10	{.10 .06

CROSS-SECTION OF MASONRY DAM

1 0 5 M

Carlton E Davis Dept Eng

Case2 Dr5l Acc R1628

PTS	IN.
10	{.10 .06
12	.12
18	.18
12	.12
10	{.10 .06
10	.10
10	.10
10	{.10 .06

14 $\frac{1}{2}$ " X 20" SHEETS

JULY 17, 1906

Drawn by J.D.
Traced by J.H.
Checked by

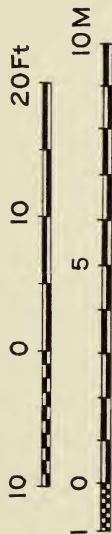
Case Dr Acc 2434

REGULATIONS

SIZES OF LETTERS FOR STANDARD TITLES.

TITLE FOR DRAWING:	FIRST LINE.		SECOND AND FOURTH LINES.		THIRD LINE.		FIGURES AND LETTERS ON SCALES.		DATE.		SIGNATURE AND ACC.	
	Points.	Inches.	Points.	Inches.	Points.	Inches.	Points.	Inches.	Points.	Inches.	Points.	Inches.
Larger than 26" x 40"	18	cap. 0.18 l. c. 0.12	24	cap. 0.26	42	cap. 0.45	12	cap. 0.12 l. c. 0.08	14	cap. 0.15	12	cap. 0.12 l. c. 0.08
26"x40" and 20"x29"	14	cap. 0.15 l. c. 0.10	18	cap. 0.18	30	cap. 0.32	12	cap. 0.12 l. c. 0.08	12	cap. 0.12	12	cap. 0.12 l. c. 0.08
14½" x 20"	10	cap. 0.10 l. c. 0.06	12	cap. 0.12	18	cap. 0.18	10	cap. 0.10 l. c. 0.06	10	cap. 0.10	10	cap. 0.10 l. c. 0.06
11" x 18" and smaller	10	cap. 0.10 l. c. 0.06	10	cap. 0.10	14	cap. 0.15	10	cap. 0.10 l. c. 0.06	10	cap. 0.10	10	cap. 0.10 l. c. 0.06

City of New York
 BOARD OF WATER SUPPLY
EAST DURHAM RESERVOIR
 CROSS-SECTION OF MASONRY DAM



JUNE 28, 1906

Carlton E. Davis Dept. Eng.
Waldo Smith Chief Eng.

Case 2 Dr 51 Acc R1628

REGULATIONS

ings, and such others as might go outside of the Board's jurisdiction, provided their importance justifies it. Each drawing is to be made to a scale suited to its purpose. Excessively large or small scales and unusual scales are to be avoided. For maps and similar drawings, with few exceptions, the following scales shall be used, 20, 40, 100, 200, 400, 1000, 2000 ft., 1 mile and 5 miles to an inch.

187. For drawings of engineering structures and details, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 3 and 6 inches per foot and 10, 20 and 40 feet to an inch are generally to be employed. For architectural drawings, 1-16, for sketches and studies, $\frac{1}{8}$, $\frac{1}{4}$, 1, 3 and 6 inches per foot and full size shall be used commonly. It is good practice to make working drawings to such scales as permit the use of an ordinary two-foot rule.

188. On profiles the vertical and horizontal scales shall usually have ratios of 4 to 1, 5 to 1, or 10 to 1; and 20 to 1 in special cases only. For field cross-sections, to be used for estimates and other purposes, green cross-section sheets 19" x 24", scale, 5 feet to an inch, shall be adopted. These sheets shall be filed in Tengwall files.

189. The following color scheme has been adopted for progress sheets:

January and July—Light green.

February and August—Light purple.

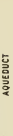
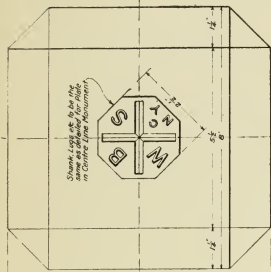
March and September—Light yellow.

April and October—Light scarlet.

May and November—Light blue.

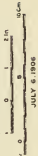
June and December—Light brown.

190. When a week is partly in one month and partly in another the two prescribed month colors shall be used to indicate that week's work, each color to be properly proportioned.



The bottom of foundation must be at least one foot below the frost depth, and firmly imbedded in surrounding earth.

City of New York
BOARD OF WATER SUPPLY
STANDARD MONUMENTS



SURVEYING

191. It is assumed that each man has an adequate preparation for the duties assigned to him. Hence information which can be found in text books and engineering periodicals is not repeated in this manual.

192. All survey, level and other field notes, including estimate measurements of contract work and measurements for records of completed structures, shall be made on 5" x 8" single or double note sheets, printed for each kind of work. The leather covers provided shall be used for carrying these note sheets in the field. As rapidly as the sheets are filled with notes they shall be delivered to the man in charge of the files in the proper office, who shall file them in a systematic way, approved by the division engineer, in 5" x 8" drawers.

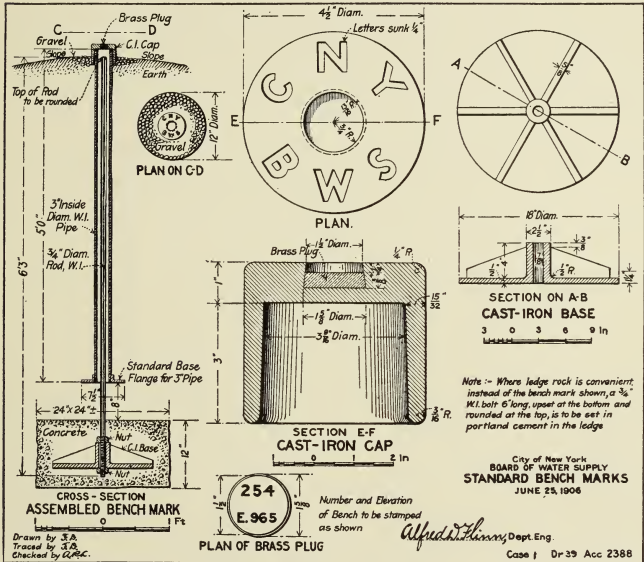
193. All notes and records must be so full, clear and legible that they can be quickly and intelligently interpreted and plotted by any competent person who did not make them and who may be unfamiliar with the section surveyed. The conventional symbols, shown in the illustration, should be used in the field notes, so far as practicable.

194. Each note sheet or any single map or other record should be plainly marked with all information necessary for filing it in its proper place. All records to be filed should be transmitted to the proper person.

195. Each note sheet must be headed with a brief description of the location of the survey, with the day of the week, month and year, and the name of the observer and recorder; the observer being the man who actually runs the instrument. The condition of the weather, also the number and maker of the instrument used and the number of the tape used on transit lines must be recorded. Each set of notes,

SURVEYING

such as transit, level, stadia, etc., must be numbered consecutively through the series for each separate party, beginning with number 1. Numbers shall not be written in the file number space on the sheet, until written by the person having charge of filing the sheets.



196. No record, when once made, shall be erased. When an erroneous note is recorded, it shall be cancelled by drawing a line through the figures, and re-written correctly.

197. All important computations must be checked, and when checked, a check mark \checkmark , placed after them. On each sheet must be written the name of the person who made the computations, and who checked them. Records and notes of assistant engineers will be examined from time to time by the division engineer to see that instructions are being fully observed.

REGULATIONS

198. All survey notes must be reduced and checked up to date, as nearly as possible, in order that a constant check may be had, and any corrections or omissions supplied, while the party is in the immediate neighborhood of the work.

STADIA WORK

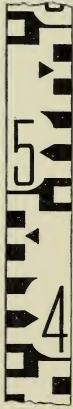
199. The assistant engineer in charge of a party should impress upon the rodmen the importance of quick, systematic selection of characteristic points and a thorough appreciation of the value of these points.

200. Careful consideration should be given to the purpose of the survey and the scale upon which the map is to be plotted, sufficient contour points being taken to show the changes of surface on that scale.

201. The observer should have a system of signals for his party that will enable him to direct his men correctly and surely at a distance.



Metropolitan



U.S.



Noble



Freeman

FACES OF STADIA RODS

SURVEYING

REAL ESTATE

202. All lands to be plotted should, in the course of surveying, be classed as: woodland; pasture land; arable; waste or rock land.

203. Woodland, should be subdivided into timber; small trees, which are suitable for fence posts or fire wood; brush; and burnt areas. Pasture or grass land, may be divided into land good for pasturage and hay crops; and land with stumps and brush. Arable, designates land suitable for raising crops or for orchards. Waste and rock lands, may be sandy strips or marshes, or steep rock ledges bare of timber, or lands thickly strewn with boulders. These classifications may be subdivided and modified to fit local conditions, but the designations must be clear. Notes in accordance with this classification should be made at the time of the actual survey.

204. On note sheets or sketches, record schools, churches, private burying grounds, barns and outhouses; whether a house is of brick, wood or stone, and its general condition; whether occupied or unoccupied; also quarries, mills and factories, with a description of the manufactured article and approximate output, if possible. Stores should be classed as general or specific, according to the actual business.

205. Ponds, travelled roads and wood roads, rights of way, groups of houses, streams suitable for watering of cattle, springs and other sources of water supply should be noted.

CARE OF INSTRUMENTS

206. Men having charge of any kind of instruments in field or office will be held responsible for them and will be required to pay for repairs made necessary by damage unless they can satisfy the department or division engineer that they were not in fault.

207. Every man given charge of an instrument is expected to know, or to learn at once, how to use and care for it properly. Detailed information about the manipulation, care,

REGULATIONS

adjustment and repairs of instruments will be found in manuals and makers' catalogs.

208. When shipping an instrument, especially a transit or level, the packing case should be marked plainly with black or red letters: THIS SIDE UP, HANDLE WITH CARE, VALUABLE INSTRUMENTS, and KEEP DRY. A tripod may be packed in a close fitting box, but if such a box is not at hand, the head and shoes should be covered with paper and burlap and the legs securely tied. Whenever possible on the works it is best to transport instruments by special messengers.

209. As soon as any instrument is received, it should be unpacked, and all cushions, paper and other packing material removed. An inspection should be made at once to determine whether it is complete and in good condition. Instrument packing boxes should be saved.

210. When instruments to be repaired are sent by a field office directly to the maker, full advices should also be sent the same day to Headquarters office.

CONSTRUCTION WORK

211. Preliminary and other investigations and examinations such as borings, special tests, etc., will be made from time to time by the Board under informal agreements. Construction work will be done under formal contracts. All engineers and inspectors connected with construction work are required to have an intimate knowledge of the provisions of contracts and specifications.

212. Assistant engineers designated to give lines and grades will be held strictly responsible for their accuracy. The degree of precision required will depend upon the kind of work. In giving grades a check must always be made at the end of the work on the original bench or on another established bench mark, also on the grade previously fixed. It is always well to check grades by sighting with the eye. Survey marks or points, unless of only slight or temporary importance, should be carefully referenced, so that if disturbed they can be re-established without a new survey.

213. All preliminary work such as cross-sectioning the surface of the ground shall be done before the contractor is ready to begin operations. The contractor is required to give reasonable advance notice of the work to be done, step by step. Engineers should anticipate the wants of the contractor. They should push the work and not let the work push them.

214. While the contractor is to use every precaution to preserve the marks and is responsible for their preservation, in case of failure it is better to duplicate work than to cause delay. It is not sufficient simply to stake out work and let it take care of itself. Assistant engineers should see that the inspectors and foremen understand the information given and have full instructions, and that instructions are obeyed.

REGULATIONS

215. Full and careful notes shall be kept of all line and grade work so that, should a dispute arise, it would be possible to refer to the original notes and prove their accuracy or, in case of error, to fix the responsibility. Notes should be checked in the field before the information is given to the inspector and contractor. Notes shall be made on standard forms to be provided and shall contain date, location of work, character of information, and the names of the members of the party. The person who makes the notes and the one who checks them must be designated by names. They shall be stamped with the dating stamp as soon as received in the section office and be filed and indexed.

MONTHLY AND FINAL ESTIMATES

216. Measurements for monthly estimates shall be provided for in advance so far as possible in order to avoid congestion on estimate day. A separate set of notes should be kept for final estimates. In making estimates the quantity for each item shall be calculated and tabulated on standard computation sheets unless special blank forms are provided.

217. Estimates for payment under contracts and agreements shall be made strictly in accordance with the terms of the individual contract or agreement. Estimates for partial payments, made at monthly or other intervals, need be approximate only; fractional quantities should not be entered. Give the quantity for each item to the nearest whole unit of measurement, or to round figures, according to the nature of the item. Measurements and estimates of quantities should, however, be made with care and corrected from time to time to secure greater accuracy.

218. An assistant engineer shall be designated to make the measurements and computations for estimates. He will be held responsible for their accuracy. The summary of the computations showing the work done shall be made out on the proper form, signed by the section engineer, and promptly

CONSTRUCTION WORK

forwarded to the division engineer. These summaries are to be reviewed by the division engineer and used as a basis for his estimates.

219. All estimates should be made and forwarded to Headquarters promptly. For each large contract requiring a number of partial payments, special estimate blanks will be printed. For small contracts requiring only a few payments, a standard general form will be used. Estimates will be made in division offices. The original should be made in copy ink or pencil and sent to the department office, a carbon copy being retained in the division office. After receiving the signature of the department engineer, a tissue copy is to be taken and the original sent to Headquarters, where the extensions and additions will be checked and the official copy for payment and filing typewritten in multiple.

220. In writing contracts it will be provided that estimates in each department shall be made on the tenth, twentieth and thirtieth of each month for different contracts or for different portions of large contracts, so as to distribute the work both in the field and at Headquarters and thus avoid congestion and serious interruption of other work on account of estimates.

221. As rapidly as parts of the work are completed, final measurements should be made and the quantities computed so that, when all the work under a contract or agreement shall have been completed, the final estimates may be prepared in the shortest possible time.

222. At least once a month, and at other times when it will not interfere with work on the monthly estimates, these final measurements shall be combined and the final quantities ascertained. These quantities shall be entered in the next monthly estimate, replacing the quantities used previously. In this way the final quantities can be carried along with the monthly estimates, and the final estimates will require but little work other than compilation.

REGULATIONS

INSPECTION

223. Inspectors of masonry and other construction shall be assigned by the section engineer. Each inspector shall be constantly present on his work while it is in progress. He shall call the attention of the contractor or his foreman to any departure from the specifications or the orders of the engineers. Should this notice be disregarded, he shall immediately report the facts to the section engineer.

224. The section engineer should act as chief inspector of the construction under his charge and shall keep in close touch with the general progress of the work, with which he shall be familiar in every detail. He shall be responsible for the efficiency of his inspectors and shall decide promptly questions at issue between his assistants or inspectors and the contractor. Such questions as appear to him to be of sufficient importance he shall refer to the division engineer.

ORDERS TO CONTRACTOR

225. All dealings with contractors are governed by the terms of the contracts, the rights and duties of both parties to the contract being well defined. Under no circumstances shall there be duplication of orders or uncertainty as to the persons responsible for giving orders. Written orders of a general nature shall be given contractors by the department engineer only or by his specific direction. Orders involving questions of policy should not be issued by the section engineer but should be referred by him to the division engineer.

226. The section engineer shall keep a diary in which shall be entered the record of written reports of inspectors and orders to contractors. He shall keep the division engineer informed of his orders to inspectors and contractors. Copies of orders and information concerning them, which are of sufficient importance, shall be forwarded to the division engineer. A diary shall also be kept in the office of each division engineer, which shall include a summary of the reports of the various section engineers.

CONSTRUCTION WORK

CONTRACTOR'S CLAIMS FOR ALLOWANCES OR DAMAGES

227. The section engineer shall cause careful and complete notes to be kept in his office of anything which may be construed to be extra work and of all damage to the work. Too much emphasis cannot be laid on the importance of keeping the records of claims or possible bases for claims for extra work or damages complete and up to date.

CLAIMS FOR DAMAGES BY PROPERTY OWNERS

228. A full record of damages and alleged damages to property on account of the work shall be kept by the section engineer. Care should be taken to index and file such information so that it may be available at any time.

229. Should a claim for damages be made by a property owner on account of the work, the section engineer shall be notified of it and he shall promptly investigate the matter. He shall, if possible, interview the owner or his agent and ascertain from him the character and extent of the alleged damages and the owner's estimate of the value of them. He shall also make his own estimate and description of the alleged damages, and shall prepare a report giving this information and such additional pertinent facts as he may be able to ascertain and shall forward it to the division engineer with his recommendations.

230. If the claim is of sufficient importance, the division engineer shall investigate it personally and add to the section engineer's report such information and recommendations as seem necessary, and shall forward it to the department office for transmission to the Chief Engineer.

ACCIDENTS

231. Accidents resulting in injury to persons or property, or other matters out of the ordinary routine, shall be reported in detail on approved forms to the section engineer by the

REGULATIONS

assistant engineer or other employee witnessing or having cognizance of them. Care should be taken to give the names and addresses of all witnesses and the exact time and place of accidents. The section engineer may add to the report of his subordinate when necessary to make it complete. It should be then forwarded to the division office for indexing and filing. Copies of reports of the more important accidents shall be sent by the division engineer to the department office and, if it is considered necessary, transmitted promptly to the Chief Engineer. Photographs or drawings should accompany accident reports when necessary.

RECORDS OF PROGRESS

232. A progress profile and diagrams, plotted on appropriate scales, shall be kept in the department office. They will be compiled from information reported by the division offices, where copies of the portion pertinent to the particular division shall be kept. The proper monthly estimate color is to be used, and in the space for each month's work shall be the number of the estimate. About the fourth day of each month each department office shall send to Headquarters a tracing of such parts of the profile and diagrams as shall show an increase of work during the preceding month; this information to be transferred to the profile and diagrams in the Headquarters office.

233. For each important contract there shall be kept in the division and department offices a monthly diagram, plotted on letter size sheets, $8\frac{1}{2}" \times 11"$, or on sheets which will fold to this size, showing the percentage done of the estimated total value of each principal item of the contract, also the percentage done of the estimated total value of all the work. A print of each diagram is to be sent to Headquarters office, with the progress profiles.

234. As far as possible, notes showing the progress of the work are to be kept in graphical form, plotted in the field

CONSTRUCTION WORK

and afterward inked in the office in the proper estimate color. They are to be made as complete as possible, showing the stratification of the rock, type of construction, etc., for use in the completion of the record drawings. Estimate areas are to be consecutively numbered to correspond with the estimate numbers. These graphical notes kept on standard forms will be a portion of the record of progress, and profiles and other diagrams may be prepared directly from them.

COST ACCOUNTS

235. In order to determine as nearly as can be the actual cost of the work from time to time careful records of the contractor's plant, force, and materials shall be kept on suitable forms. Drawings showing the arrangement of machinery and descriptions of methods shall be made in the section engineer's office.

236. Timekeepers or inspectors shall keep daily records of the several kinds of work done, of the number of men employed in the various classes, their probable pay, etc., and of the materials used. Records shall also be kept of the contractor's tools and the cost of running machinery. The section engineer shall detail men to collect these records and compile cost accounts, the various items to be distributed among the different kinds of work done.

237. In addition to the cost of labor and materials, separate records should be kept, if possible, of the administrative cost, including salaries of superintendent, bookkeepers and others, transportation, office supplies, etc., of general work including the setting up of plant and removing it and such shop work as is chargeable to the whole contract. These general items should not be distributed but should be reported separately.

238. Use "engineman" for a person who runs an engine or cares for machinery to distinguish him from a professional engineer.

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239. Force and material account records shall be daily compiled on large monthly blanks, which shall show the cost month by month of each class of work and the total cost of work. Each section engineer shall send a weekly summary to the division engineer. Monthly records shall be worked up within a week of the time of making up estimates, under the direction of the section engineer, who shall be responsible for the results. They shall be so kept that blue print copies of them may be taken and furnished to Headquarters and to division and other offices.

240. Methods of keeping cost accounts, classification, etc., shall be prescribed by the department engineer in order that uniformity may be secured and so that the separate section reports, as furnished through the division engineer, may be compiled monthly in the department office. A summary of results shall be sent monthly by the department engineer to the Chief Engineer.

RECORDS OF EMPLOYEES

241. Applicants for positions in the Engineering Bureau are requested to fill out an Application for Employment, form 4E, giving references. These applications are used only for the purposes of the Board. To each reference is sent a blank, form 17E, which has questions about the general ability and character of the applicant. These, when returned, are filed with the application.

242. Immediately after an appointment has been made, notification of it must be sent to the appointee on form 72E, from Headquarters. Upon notification of appointment, if possible, or when reporting for duty, an appointee must file an acceptance, form 6E, and the declaration sheet required by the Civil Service Commission; and the department engineer must at once send these and a card, form 8E, to Headquarters, giving the date when the employee reported for duty.

243. The payroll clerk at Headquarters must obtain, after ascertaining from the minutes of the Board and checking from his own data, the date of appointment, the title, the salary, etc., of the appointee, and send a card, form 23E, to the Secretary of the Board notifying him that the appointee has reported for duty. The previous record of the appointee must then promptly and accurately be put on a card, form 60E, for reference, and his name registered on the payroll for the current month, if employed on salary.

244. Accuracy and promptness in reporting the time when a man begins work are imperative. If in any case a declaration sheet can be sent before a man reports for duty, it should be sent. Declaration sheets properly *signed and witnessed must be sent to Headquarters as soon as possible.*

245. If the appointee is not a veteran, he should write Not, in the proper place on his acceptance; if a veteran, he must file proof at once.

246. An employee should give, if possible, at least two

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weeks' notice before severing his connection with the Engineering Bureau. Whenever an employee is separated from the force, a card, form 23E, stating the time of separation and the reason therefor, must be sent at once from the department office to Headquarters.

247. After each regular meeting of the Board, each department engineer will be informed of the changes of service affecting his department.

PAYROLLS AND TIME REPORTS

248. Payrolls are weekly or monthly, according as the men are employed by the day or the year. They are made at Headquarters, and based upon weekly and monthly time reports from department offices, on forms 35E and 65E. Fifteen names only should appear on each sheet of a weekly or monthly time report. This will conform to the arrangement of the payroll sheets and will facilitate the computation of the totals on payrolls.

249. Civil Service regulations require that when a man has been absent from duty, and such absence is noted on the time report, a letter should accompany this report giving reasons for absence. The Civil Service Commission insists that this formality be complied with and will refuse to pass any payroll for which such statement is not given.

250. Upon every weekly time report, showing overtime for any man, a statement must be made in each case as to whether or not the man worked on Sunday. A certificate must accompany each payroll stating whether the overtime is exclusive or inclusive of Sundays.

251. In computing the amount of salary, if the figure in mill's place is six or more, another cent may be allowed, but not otherwise; i. e. \$25.376 may be taken as \$25.38. This applies only when an employee is credited with a fraction of a month; in computing the average monthly salary, this rule shall not obtain, as in that event, a man in an entire year would be credited with an amount in excess of his annual salary.

RECORDS OF EMPLOYEES

252. On the fifteenth of each month, or on the day preceding if it be Sunday or a holiday, department engineers must forward to Headquarters monthly time reports for the current month. The accuracy of the time reports will be verified by referring to the record cards. Weekly time reports must be forwarded so as to arrive at Headquarters each Monday morning.

253. Employees, except laborers, reporting after the fifteenth of the month will be placed upon a supplementary payroll for that month. Each department engineer shall send supplementary time reports to Headquarters on the first day of the ensuing month for all such employees.

254. If a man should be separated from the force before the end of the month, Headquarters should be notified at once, by wire if necessary, so that the matter can be properly adjusted with the Paymaster.

255. Daily Report of Work, form 70E, is intended for keeping track of the number of men or the particular men, by name, employed from day to day upon any specific portion of the work of which such a record may be desired.

256. Form 68E, Monthly Record of Work, and 69E, Yearly Time Card, are time cards on which certain employees, as instructed by the department engineer, must keep a record of their work, or one man may be delegated to keep these.

TRANSFERS

257. The matter of transfers to and from the Board shall be handled exclusively by the Headquarters Department. Requests shall be forwarded to the Department Engineer at Headquarters in the same manner as a request for a regular appointment from a Civil Service list.

258. Transfers from one department to another, within the Engineering Bureau, shall be arranged by the two department engineers interested. The Headquarters Department shall be notified after the matter has been arranged.

EQUIPMENT AND SUPPLIES

259. Instruments, machinery, furniture and other equipment, stationery, drafting materials and other supplies can be obtained through Headquarters office. At Headquarters a stock of standard instruments and supplies is kept for shipment on short notice.

260. Each department and division office shall have a place for the safe storage of such supplies as are needed for immediate use, where a system of accounting shall be followed as hereafter explained.

261. All surveying and drafting instruments, including triangles, scales, books, etc., all tools, machinery and other articles of equipment belonging to the Board shall be plainly and permanently marked for identification. It shall be the duty of one or more assistants in each department to do this marking as the articles are received, or delivered from stock for use.

262. It is the policy of the Bureau to standardize the stationery, drafting supplies, furniture, engineering instruments and other usual equipment, so far as possible. This is for economy and convenience in purchasing and accounting. No unusual or peculiar article should be asked for unless there is sufficient reason why a standard article cannot be used. Requisition for a special article instead of the standard should be accompanied by an explanation. Questions relating to equipment, supplies and accounts should be referred to Headquarters Department.

METHOD OF ORDERING

263. Need for equipment or supplies should be made known by means of requisitions, called Field Orders, form 53E. Whenever calling for unusual things, field orders should be accompanied by letters of explanation or specifications.

EQUIPMENT AND SUPPLIES

Sketches or drawings should be sent when necessary. Field orders sent to Headquarters shall be signed only by the Chief Engineer, Deputy Chief Engineer, or the department engineer; or by subordinates designated by them, who must sign their superior's name as attorney. The date on which delivery is required shall be noted in its proper place on each field order and the word Rush shall not be used except when really meant. Headquarters should be notified *at once* if goods are not received when expected, if goods are damaged when received, or if any articles are missing.

264. When a field order originates in a section office, two copies shall be made; a tissue copy to be retained, and a carbon copy to be forwarded with the original to the division office. If the field order meets with the approval of the division engineer, it shall then be signed by him. Supplies which can be furnished by the division store shall be delivered, and corresponding items on the field order marked, Delivered. If any items remain unfilled, the field order shall be forwarded to the department office. Additional supplies may be furnished from the department store.

265. When the department store needs re-stocking, or when an article is needed which is not usually kept in stock, a field order upon Headquarters shall be prepared covering all the goods which may at that time be required for delivery at one point. It shall be signed by the department engineer and forwarded to Headquarters, a copy being retained. The stock-keeper at Headquarters shall fill the order either from stock, or by requisition upon the makers or dealers for direct shipment.

266. When possible, field orders shall be typewritten and they should be specific and accurate. For standard equipment and supplies they shall be forwarded to Headquarters on the first and fifteenth of each month only. Field orders about repairs should embody a clear statement about extent and nature of repairs.

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QUARTERLY REQUISITIONS

267. For convenience in obtaining promptly certain classes of necessary services or supplies the board has approved general requisitions, each of which covers a period of three months. Under these requisitions any authorized engineer may order services or supplies involving a limited expenditure. For this purpose form 27E is used. Instructions are given on the cover of the book containing this form. The original, or yellow sheet, is to be given to the dealer or workman to be forwarded with his bill in triplicate to Headquarters. The white perforated blank is to be forwarded at once to Headquarters. The requisition number must be given on each order. When an order is for services, the length of time must be stated. This period must not exceed one month.

268. The quarterly requisitions customarily approved are as follows:

Team hire, for transportation of field parties.

Cartage, for field parties, hauling water and moving materials.

Timber, for stakes.

Coal, and other fuel.

Board and lodging, for surveying parties.

Sun printing.

Map mounting.

Lithographing.

Printing.

Photographic supplies.

Binding, for periodicals.

Typewriting.

Care of rain and river gages.

General supplies, such as hardware, paint, lumber, etc.

269. The last item, General Supplies, refers to a quarterly requisition for a specified limited amount for each depart-

EQUIPMENT AND SUPPLIES

ment, to be drawn upon only in emergency. Every effort should be made to foresee needs and meet them by the usual specific requisitions, falling back on this source of relief only when it cannot be avoided. Supplies are to be secured under this emergency requisition only upon field order signed by a department engineer. Bills for such supplies should be rendered directly to the Board of Water Supply by the vendor in the usual manner, and the field orders will be confirmed by the chief clerk of the Administration Bureau writing an order against the requisition in the regular way.

ACCOUNTING FOR EQUIPMENT AND SUPPLIES

270. One person in each office shall be made responsible for the proper distribution of and accounting for equipment and supplies. Accounts shall be kept mainly on 5" x 8" cards furnished for the purpose. They are of three kinds, Perpetual Inventory, Distribution and Instrument cards.

PERPETUAL INVENTORY CARDS

271. One card, form 81E, is to be devoted to each kind of equipment or supply and shall have a description of that article sufficient for easy identification, as indicated by the headings on the card. This card is intended, first, as a list of the engineers having unfilled requisitions for the article; second, as a record of the orders made by the office where the cards are kept on the next superior office; third, as a record of the shipments received; fourth, as a record of deliveries; and last, as a perpetual stock-room inventory. The cards shall be filed, first, by classes, as surveying instruments, drafting supplies, stationery, etc., and under each class alphabetically by names of articles.

DISTRIBUTION CARDS

272. One card, form 82E, is to be devoted to each kind of equipment or supply and it is intended to show by the successive shipments, the quantities of that kind of goods which

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have been delivered to each of the offices next inferior to the office where the cards are kept. The distribution cards kept at Headquarters office show the distribution by departments, those at the department offices show the distribution by divisions, and those at the division offices show the distribution by sections. These cards shall be used as a guide by the Headquarters stock-keeper in the semi-annual stock-taking. They shall be filed in the same manner as are the perpetual inventory cards.

INSTRUMENT CARDS

273. One card, form 83E, shall represent each valuable article, whether it is an instrument, a machine, or a piece or class of furniture. It shall bear a detailed description of such article and every important change of place or condition shall be noted. These cards shall be filed, first, by classes; next, alphabetically, by names of articles; and last, by individual numbers. The extent to which this part of the accounting is to be carried will be determined by the engineer in charge of equipment and accounts in Headquarters office.

WAY BILLS

274. When goods are shipped from a stock-room, they shall be accompanied by a way bill, form 80E, and one carbon copy; a tissue copy being retained. The engineer receiving the goods shall acknowledge receipt in the space prepared and return the original. The acknowledgement shall be noted on the distribution cards.

275. When goods are to be shipped directly from the manufacturer to the engineer requiring them, a copy of the order to the maker shall be sent to the engineer prior to the shipment. Upon receiving the goods he shall check the items as to quantity and quality, fill out a way bill, form 80E, address it to himself, acknowledge receipt and forward it to Head-

EQUIPMENT AND SUPPLIES

quarters. He shall retain one copy, and if in a section office, forward one copy to his division office and one to his department office; if in a division office, forward one copy to his department office. The acknowledgement shall be noted on the distribution cards.

CHECKING BILLS

276. When a bill is received at Headquarters for goods shipped directly from the maker to the field, it shall be sent to the department office, and if correct, shall be approved by the department engineer and returned to Headquarters, in triplicate.

277. When goods are to be transferred from one field office to another, a transfer slip, form 75E, shall be filled out with a copying pencil and sent with the goods, a carbon copy to be retained. The engineer receiving the goods shall acknowledge receipt upon the original transfer slip, make a tissue copy, and forward the original to the office next superior to his own. Transfers of property shall be noted on the distribution cards in red ink, as a shipment, crediting the goods to the engineer transferring them.

278. Once in each half-year, at a time to be appointed, the distribution cards of each field office shall be compared with those of its subordinate offices, the necessary corrections made, and all instruments and supplies prepared for inspection.

279. The distribution cards kept at Headquarters shall then be compared with those of the department offices, an actual count of the equipment shall be made by the stock-keeper of Headquarters Department and the discrepancies noted. This stock-taking shall be the basis of an annual report to the Board, showing quantities of goods received and distributed and the percentage used or destroyed within the period.

EXPENSE ACCOUNTS

280. All claims for expenses or disbursements must be for one current month only, must be made on the blank provided, form 37E, in duplicate, on the typewriter or with ink, and must have the items arranged consecutively in the order of dates. Original and duplicate expense account bills must be alike, including signature, affidavit and approval. They must reach Headquarters before the fifth of the month.

281. The name at the head of an expense bill or voucher and the name signed must in all cases be exactly identical. A voucher from a man who cannot write must have a witness to his mark. Each item on the expense bill must show the kind of article and, unless the supplies or services were furnished for a lump sum, the number of units, such as pounds or hours, and price or rate.

282. Equipment or supplies should not be purchased on personal expense accounts, excepting occasional small items. Needs should be anticipated and proper requisitions drawn. Even in an emergency the need can usually be met by a confirmatory requisition, which latter should be sent to Headquarters as soon as possible with the necessary advices.

283. Expense accounts of subordinates, if properly made and attested on form 37E, in duplicate, and receipted, may be included in, and attached as vouchers to, the expense bills of department, division or section engineers, or officers of similar rank. If properly done, this will reduce work at the New York office and in the Department of Finance.

284. Duplicate vouchers must accompany expense bills, whenever it is possible to obtain them, for items of one dollar and over, excepting railroad or boat fares, street-car fare, ferries and tolls; but the expense bill must show from what point to what point each railroad or boat fare was paid, and the route travelled, if more than one exist.

EXPENSE ACCOUNTS

285. Vouchers accompanying an expense bill should be numbered consecutively for identification and these numbers used on the bill when referring to the vouchers. Items given in detail on vouchers may be stated very briefly in the expense bill.

286. Vouchers accompanying expense bills should be full, yet concise, and signed by the person or company receiving the disbursement. If unusual prices are paid, or it is necessary to buy some unusual article for specific needs in an emergency, an explanation should be attached to the bill. Original receipts for freight charges must accompany expense bills having such items. It is well to attach a copy of a telegram to the expense bill having such an item.

287. For every expenditure made by an employee of the Engineering Bureau, requiring a voucher and not covered by a receipted bill, a receipt shall be obtained, using form 28E. These receipts shall accompany expense accounts.

288. When a livery is hired, the name of the person from whom it is obtained, date and rate should appear on the voucher with brief description and a statement of the purpose of trip and authority for use.

289. When charges are made for subsistence, the item should be designated as breakfast, dinner, supper or lodging. Lodging for January 5th, is for the night of January 5-6, for example. If one voucher covers a series of consecutive days, the time elapsed should be stated definitely, as from such a date to such a date inclusive. For any such charge, one voucher only should be made to cover the full period, unless the period should exceed one month. The period of subsistence should be stated in full days or quarters, each meal or a night's lodging being rated as a quarter day. It is not necessary to obtain vouchers for single meals.

290. All expense bills must be sworn to in duplicate before a commissioner of deeds or notary. An expense bill, being a sworn statement, is considered as having all items appearing thereon sworn to in detail.

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291. While not an absolute rule, it is better not to make erasures or corrections on expense bills, as question may arise whether these were made before or after the affidavit. If it is necessary to make an important change, this must be stated and acknowledged by the person rendering the bill, so as to avoid trouble in the Comptroller's office.

292. Expense bills must be approved by the engineer in charge and forwarded to the proper department engineer for his approval. Expense bills of department engineers must be approved by the Chief Engineer, Deputy Chief Engineer, or in their absence by the Department Engineer of Headquarters Department.

293. After approval, bills are sent to the auditor of the Board, and after passing him are forwarded to the Comptroller's office, where they must be passed by eighteen persons before being presented for payment. This is stated to impress upon the force the necessity for absolutely correct work. An insignificant error may necessitate the return of the bill to the one who made it, thus causing long delay.

LEASES

294. For leasing real estate outside of New York City the procedure is as follows: The department engineer will send to Headquarters office a description of the property desired with a careful explanation of the necessity and use for it. The description should state clearly the owner, giving full name of each member of a firm or each officer of a corporation; exact location; number, size and the position of the rooms in the building; term for which lease is requested; date when property is to be occupied; rate of rental and frequency of payment; incidentals to be included, such as heat, light and janitor service.

295. If the Chief Engineer approves the application, the lease will be made out on form 7A in triplicate and sent to the Board. If approved by the Board, it will be sent in triplicate to the Corporation Counsel for approval as to form. After being returned to the Board, it will be sent in triplicate to the lessor, who will execute it and return it to the Board. After being executed by the Board, one copy will be sent to the lessor, one copy filed in the office of the auditor of the Board, and the third copy sent to the Comptroller. *No* change in the form of a lease must be made from form 7A, which has been approved by the Corporation Counsel.

296. For leasing property within the City limits, application is made by the Board to the Commissioners of the Sinking Fund. After acting favorably upon this application, they request the Corporation Counsel to prepare a lease and authorize the Comptroller to enter into a contract on behalf of the City of New York for renting the premises.

297. Any period, as monthly, quarterly, etc., for frequency of making payments of rentals, may be inserted in a lease.

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Payments for rentals are made between the first and fifteenth of each month for the preceding month. Notify Headquarters at once if any leased property is vacated.

298. Telephone companies and some other corporations have lease forms of their own. Usually these may be used. In such cases, forms properly filled in triplicate should accompany the department engineer's letter to Headquarters office.

299. For a minor contract or agreement for services or supplies, a statement of description and necessity should be sent to Headquarters office. If approved by the Chief Engineer, the agreement is then presented to the Board for its authorization. These forms should be made in triplicate, but do not ordinarily need to be sent to the Corporation Counsel. After being executed, one copy is given to the contractor, one is filed with the auditor of the Board, and one is sent to the Comptroller.

CLASSIFICATION OF ACCOUNTS

300. Every voucher for payment, whether bill, expense bill, time report, payroll or contract estimate, must be accompanied by a classification sheet showing to what portion of the works the expenditure is chargeable. As the apportionment of charges is often a matter of judgment, too fine a division should not be attempted. If the amount of any one voucher is to be apportioned to two or more different works, even dollars should be applied to all but one of the charges, letting the odd cents fall to the latter. Remember that almost any charge, even a large one, is only a small fraction of one per cent. of the total cost and that the time taken to "split hairs" is worth something.

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